

FOREST RESEARCH REPORT



Nova Scotia Department of Natural Resources
Forest Management Planning

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Report FOR 2006-1 No.77

Growth Potential of "Old Field" Plantations in Nova Scotia

by: Jane Nicholson

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1.0 Introduction

As part of the Kyoto Protocol, Canada is committed to reducing green house gas emissions to 6% below 1990 levels between 2008-2012. Since 1990, Canada's green house gas emissions have steadily been increasing. Projecting ahead to 2010, it is predicted that Canada's emissions will be 36% above 1990 levels or 45% above our Kyoto target if no action is taken to reduce them (Government of Canada 2005).

Trees remove carbon dioxide from the atmosphere as part of their growing process and store it as carbon. Forest ecosystems are large storehouses of carbon and globally they account for approximately half of all terrestrial carbon (IPCC 2000). The realization of the important role trees play in sequestering carbon has lead to the development of Article 3.3 within the Kyoto Protocol which requires countries to account for changes in forest carbon stocks resulting from afforestation, reforestation, and deforestation activities that have occurred since 1990. Countries can claim credit for carbon sequestered as a result of establishing new forests on areas which have not recently or ever contained forest and use this to offset emission reduction targets.

The possibility of including large-scale afforestation and reforestation as a mechanism to meet part of Canada's emission reduction target is being explored, however at present there is no carbon credit system currently in place in Canada. Steps are being taken toward such goals with initiatives such as the Forest 2020 Plantation Demonstration and Assessment Program. A network of demonstration plantations are currently being established across Canada through this program. Its purpose is to evaluate how different incentive structures encourage private land owner participation and also to evaluate different cost-effective methods of establishing fast-growing plantation on agricultural land with aims of maximizing net carbon gains. It will take several years before the outcome of these demonstration plantations can be ascertained and several decades before any meaningful growth and yield data can be collected.

The Nova Scotia Department of Natural Resources (NSDNR) has established several trials across the province to determine methods to successfully afforest old fields. The NSDNR has also collected permanent sample plot (PSP) data from several plantations originating from old fields as part of the province's growth and yield program. These PSPs provide an estimate of the growth potential of several species on old fields in this region. Other sources of information on plantations originating from old fields in the Maritimes are contained within the following reports (NSDLF 1990a, NSDNR 1992, West 1984).

2.0 Objective

The objective of this report is to review existing sources of information on stands originating from old fields using trials and permanent sample plots established by the Nova Scotia Department of Natural Resources. This review will provide insight into the species and treatments which resulted in the best survival and growth on old fields in Nova Scotia. Thereby, providing a scientific basis from which to make recommendations regarding any future afforestation efforts in Nova Scotia.

3.0 Kyoto Definitions (Article 3.3)

Plantation sites must meet the following definitions for afforestation or reforestation in order to qualify under article 3.3 of the Kyoto Protocol.

- **Afforestation:** The direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and /or the human-induced promotion of natural seed sources (UNFCCC 2005).
- **Reforestation:** The direct human-induced conversion of non-forested to forested land through planting, seeding and /or human-induced promotion of natural seed sources on land that was forested, but has been converted to non-forested land. For the first commitment period (2008-2012), reforestation activities will be limited to those lands that were cut prior to 1990 (UNFCCC 2005).

4.0 Old Field Area in Nova Scotia

Based on photo interpretation, the amount of "old field" area in Nova Scotia is presented in Table 1. This represents the period from 1997-1999 for the eastern region, 1992-1997 for the central region, and 1988-2000 for the western region based on different aerial photography years for each county. These "old field" areas are defined as containing less than 25% merchantable tree cover less than one meter in height (NSDNR 1994). There is likely more area than what is presented which meets the Kyoto eligibility criteria for afforestation but was classified as agricultural land. Not all areas which satisfy the Kyoto eligibility criteria are necessarily available for afforestation as 95% is privately owned. It is evident that the success of any future afforestation program in Nova Scotia would largely depend on getting the support of small private land owners.

Table 1. The "old field" area (ha) in Nova Scotia by region and ownership.

Ownership	East	Central	West	Total
Federal	10	3	2	15
Federal - Parks	120		5	125
Federal Total	130	3	7	140
Crown	148	148	57	353
Crown - Leased	173	66	4	243
Crown - Protected	6			6
Crown Total	327	214	61	602
Private - Non Industrial	9,343	9,313	7,838	26,494
Private - Industrial	82	260	56	398
Private Total	9,425	9,573	7,894	26,892
Provincial Total	9,882	9,790	7,962	27,634

5.0 Trial & PSP Locations

The general locations of the trials and permanent sample plots within Nova Scotia are shown in Figure 1, for a more specific location refer to the trial and PSP UTM co-ordinates provided in Tables 2 & 5.

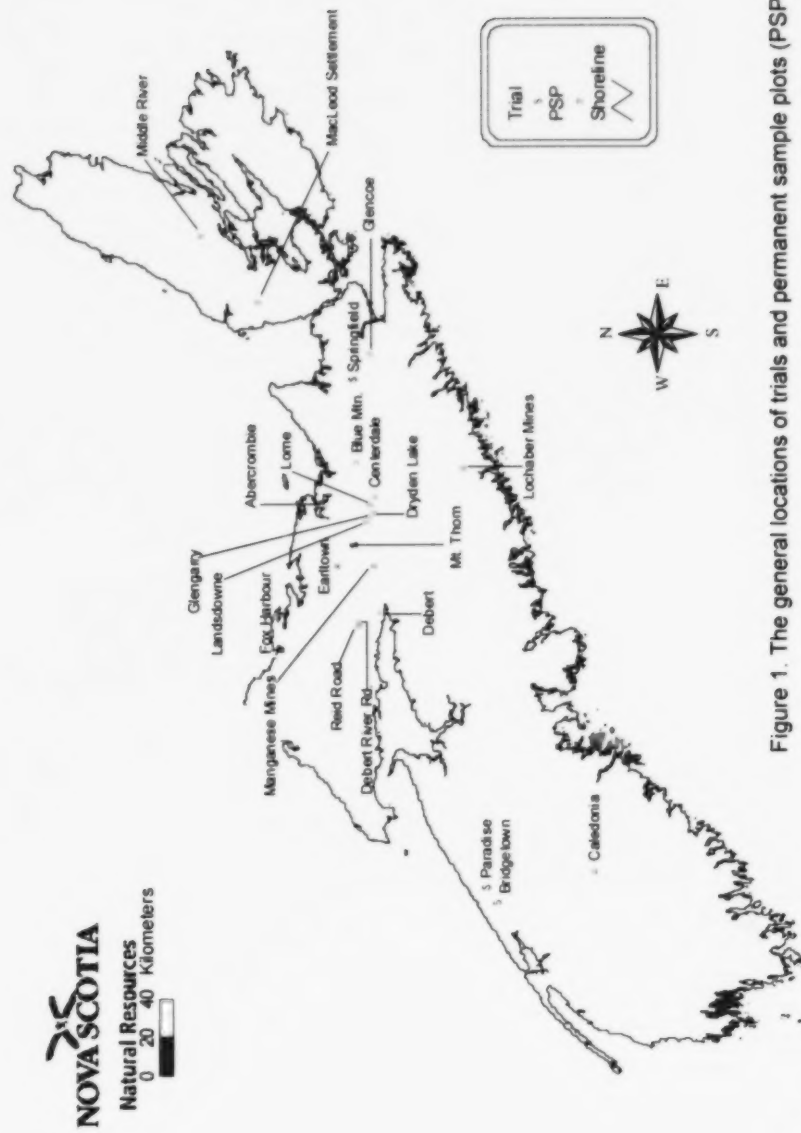


Figure 1. The general locations of trials and permanent sample plots (PSPs) within Nova Scotia.

6.0 Trials

Several trials established by the Nova Scotia Department of Natural Resources deal with the establishment phase of plantations in old fields. This report will review the results from these trials to determine which species and treatment combinations resulted in the greatest success on old fields.

The various old field site preparation trials are presented in Table 2. The species and site preparation treatments tested at each trial are listed along with the planted spacing, ownership, and general location as shown in Figure 1.

Table 2. The old field site preparation trials conducted by the NSDNR.

Trials					
Location	Ownership	Trial #	Species	Site Prep. Treatment	Spacing
Bridgetown	Private	9301	Norway spruce White spruce	Plow Velpar ^{®1} Herbicide Control	1.8m
Mt. Thom	Crown	8002	White spruce	Plow + Roundup ^{®2} Herbicide (mound vs. trench)	1.8m
Paradise	Private	9504	Balsam fir Black spruce Norway spruce Red spruce White spruce	Velpar [®] Herbicide Velpar [®] Herbicide+Fertilizer Bag Fertilizer Bag Brush Blanket Control	1.8m
Springfield	Crown	9302	Norway spruce White spruce	Plow Velpar [®] Herbicide Control	1.8m

¹ Velpar[®] is a registered trademark of E.I. du Pont de Nemours and Company.

² Roundup[®] is a registered trademark of Monsanto Company, USA. The trade name is now Vision[®] and the active ingredient is glyphosate.

6.1 Bridgetown and Springfield: Site Preparation Trial (chemical vs. plow)

An old field site preparation trial was established in 1993 by the Nova Scotia Department of Natural Resources in efforts to determine the site preparation method (Velpar®, plow, control) and species (white spruce, Norway spruce) best suited for afforesting old fields. Two locations were chosen, one in Springfield, Antigonish county and the other in Bridgetown, Annapolis county (Figure 1). Plowing was done in the fall prior to the summer in which the trees were planted. Trees were planted on top of the mound created by the plow. The chemically treated blocks were band treated in the spring with Velpar®. Trees were planted at a spacing of 1.8x1.8m. A split plot design with three replicates of each treatment/species combination at each location was used. Each replicate consisted of approximately 625 trees. Survival and height data concerning this trial is provided in Appendix 1.

Bridgetown and Springfield are different types of fields, Springfield is a wetter sites with a greater abundance of sedge species than Bridgetown which is almost entirely dominated by grass species. Velpar® is not as effective on wet (McCully *et al.* 1996) sedge sites (McCully and Jensen 2005) which resulted in different treatment responses to the site preparation techniques at the different sites. For this reason, both sites are evaluated separately.

Ten years after plantation establishment, white spruce exhibits significantly greater survival than Norway spruce at Bridgetown ($P=0.001$)(Figure 2) and Springfield ($P<0.001$)(Figure 3). White spruce is also significantly taller than Norway spruce at Bridgetown ($P=0.06$)(Figure 2) and Springfield ($P<0.001$)(Figure 3), which is contrary to what you would expect ten years after planting as Norway spruce is generally considered a faster growing species than our native spruces (NSDLF 1990a). An increased incidence of rabbit and mice browsing to Norway spruce and severe root competition from grass and sedge species in these old fields were likely responsible for this species' poor height growth. Norway spruce has a shallow root system and has been shown to have poor growth when there is intense root competition (NSDLF 1990a). A dry summer 4 years after planting also likely contributed to this species poor survival and height growth.

Statistical analysis of site preparation revealed no significant difference in survival at an alpha level of 5%, however, there is a marginally significant difference between Velpar® and controls at Bridgetown ($P=0.13$), and plow and controls at Springfield ($P=0.11$). The effect of site preparation on height is significant at both Bridgetown and Springfield. At Bridgetown, trees in Velpar® treated plots ($P=0.003$) and controls ($P=0.02$) were significantly taller than those in plowed. At Springfield, site preparation with plow ($P<0.001$) or Velpar® ($P=0.002$) resulted in significantly taller trees than controls (Table 3).

Overall, on sites with predominantly grass species, such as Bridgetown, Velpar® is the more effective site preparation tool as it effectively controls the competition long enough for seedlings to get established resulting in greater survival and taller trees. On wetter sites and sites which contain species that are less vulnerable to Velpar®, such as sedges at Springfield, Velpar® becomes less effective and plowing might be the better option. In addition, plowing aids in site drainage and the microsite provided by the mounded earth is likely more conducive to seedling survival under these conditions. However, even with site preparation Norway spruce survival at both locations was still not satisfactory (Figures 2 & 3). Based on these trials, white spruce is better adapted for survival and early growth in old fields.

Table 3. Mean percent survival and mean height by site preparation treatments at Bridgetown and Springfield 10 years after planting. Means followed by different letters are significantly different (Tukey's test, $P < 0.05$).

Bridgetown			Springfield		
Mean Survival (%)	Control	44 a	Control	42 a	
	Plow	49 a	Velpar®	50 a	
	Velpar®	61 a	Plow	57 a	
Mean Height (cm)	Plow	214 a	Control	147 a	
	Control	254 b	Velpar®	182 b	
	Velpar®	266 b	Plow	192 b	

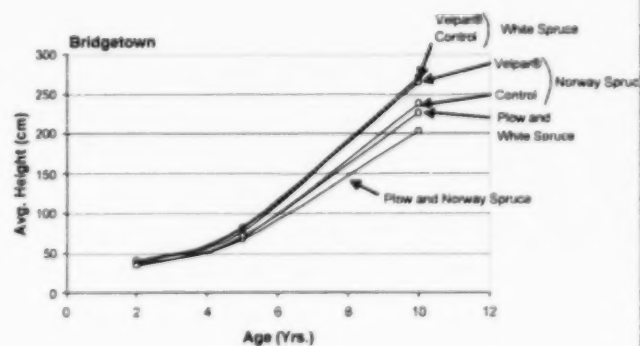
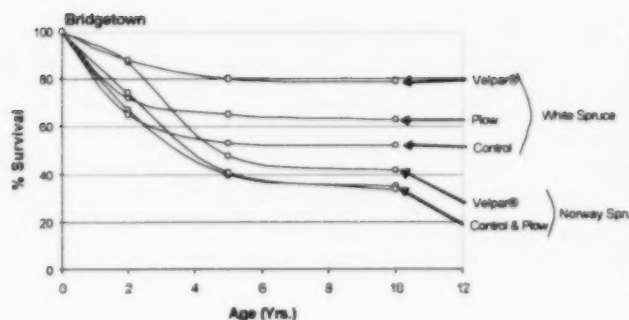


Figure 2. Planted seedling survival and average height of the various species/site preparation combinations at Bridgetown.

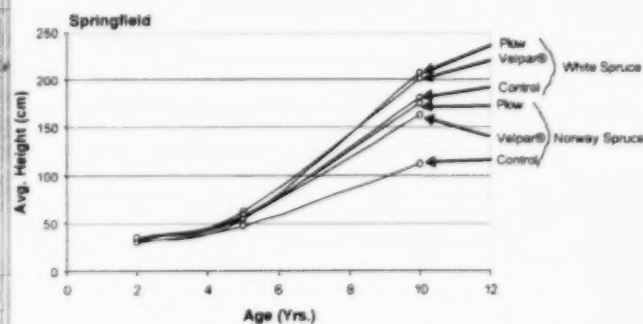
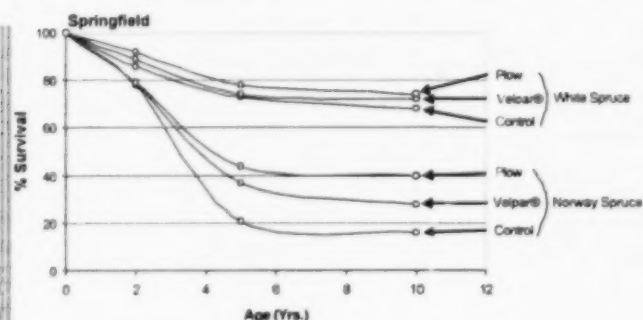


Figure 3. Planted seedling survival and average height of the various species/site preparation combinations at Springfield.

6.2 Mt. Thom: Plow Site Preparation Trial (furrow vs. mound)

This trial investigates the preferred planting location in a plowed field, more specifically the furrow versus the mound. It was established at Mt. Thom, Nova Scotia (Figure 1) on a well drained old field composed of gravelly till originating from sandstone. The field was site prepared using a single-furrow plow attached to a tractor. Half the field was planted on the mound produced by the plow and the other half was planted in the furrow. Three hundred white spruce seedlings (multipots) were planted on each half of the field for a total of six hundred trees at a spacing of 1.8 x 1.8m. Two years following planting the site received a herbicide treatment applied in bands over planted seedlings using Roundup® (4.7 litres/ha). For further information regarding this trial refer to NSDLF (1990b).

Based on the results of this trial, it is more advantageous to plant white spruce on the mound produced by the plow than in the furrow. The survival of planted trees on the mound 10 years after planting was 85%, whereas in the furrow it was 76% (Figure 4). The average height of trees planted on mounds was greater than those planted in the furrow (Figure 5). Twenty-five years after planting, there is a 6% increase in average height of trees planted on mounds compared to those planted in furrows.

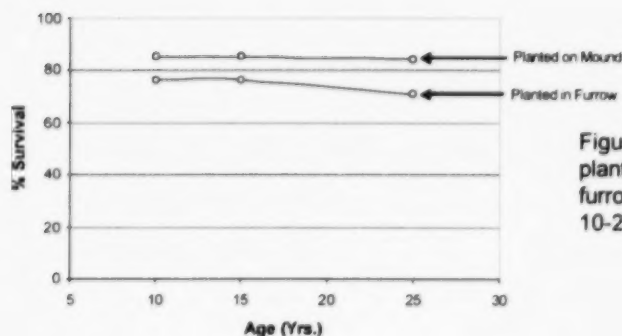


Figure 4. The survival of white spruce planted on the mound versus planted in the furrow when site prepared using a plow, 10-25 years after planting.

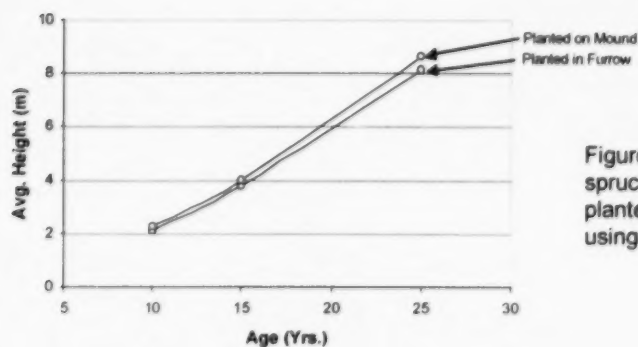


Figure 5. The average height of white spruce planted on the mound versus planted in the furrow when site prepared using a plow, 10-25 years after planting.

6.3 Paradise: Site Preparation Trial (chemical vs. brush blankets vs. fertilizer)

An old field site preparation trial was established in the southwest portion of the province near a community called Paradise (Figure 1) by the Nova Scotia Department of Natural Resources in an effort to determine the site preparation method (chemical, brush blankets, fertilizer) and species (black spruce, Norway spruce, red spruce, white spruce, balsam fir) best suited for afforesting old fields. The five different site preparation treatments included;

- Velpar® herbicide applied in bands (Figure 6)
- Velpar® herbicide applied in bands+fertilizer bag (bio-pak) placed in planting hole
- Fertilizer bag (bio-pak) placed in planting hole
- Brush blankets (Figure 7)
- Control (no treatment)

The five different site preparation treatments and five different species resulted in 25 possible treatment/species combinations. The trial was laid out in a randomized block design consisting of three blocks with one replicate of each treatment/species combination within each block. Planting took place in the spring of 1995 at a spacing of 1.8x1.8m. It was noted during planting that it was difficult to get the trees in the ground due to soil compaction.



Figure 6. Velpar® herbicide applied in bands at Paradise.

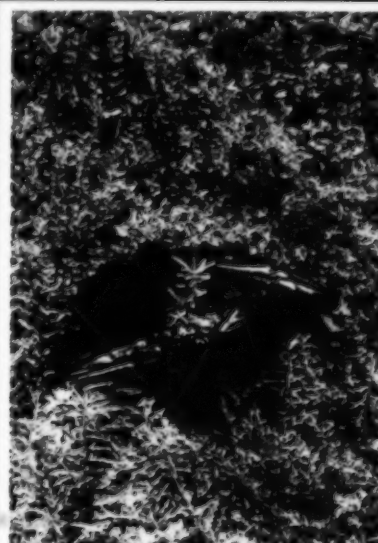
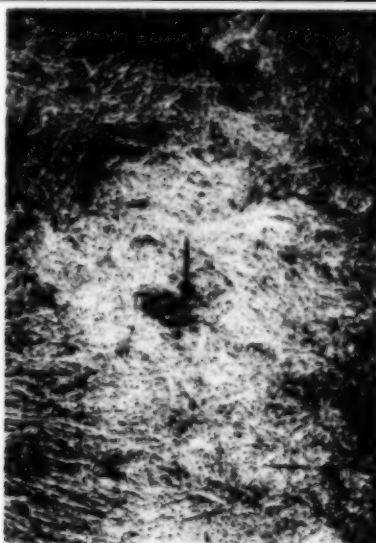


Figure 7. Brush blankets at Paradise.

For the first two years following planting there was good survival, with the exception of the fertilizer treatment and controls, after which point survival rates dropped suddenly. June bug grubs which fed on the roots of planted seedlings were a major contributing factor to this site's high mortality, fortunately the damage was uniformly distributed still allowing for comparisons to be made. The re-establishment of competing vegetation and browsing from rabbits and mice were noted as causing significant mortality. Norway spruce appeared to be particularly susceptible to browsing. Overall, after four years there was poor survival no matter what the species or site preparation treatment.

In spite of this, there are still some visible trends with respect to the different species and site preparation treatments used. Site preparation appears to be beneficial as areas with no treatment did consistently poorer than the rest. Generally speaking, although results are not conclusive, areas which received the Velpar® treatment (Velpar® alone or Velpar® + fertilizer bag) had the best survival, followed by the brush blanket treatment. The fertilizer bag treatment by itself provides no obvious benefits in terms of survival and for the most part did no better than the controls (Figure 8).

No species did particularly well under these conditions, however, black spruce, white spruce and balsam fir in conjunction with Velpar® appeared to generally have the best survival (Figure 8). Statistical analysis substantiates this claim, a significant interaction ($P=0.003$) between species and site preparation on survival was detected at an alpha level of 5%. The species and site preparation combinations mentioned above performed significantly better than most (Table 4). Black spruce in conjunction with blankets also performed well (Table 4).

Statistical analysis was not performed on height data as there was not enough trees remaining in some plots. However, overall it would appear that after ten years Norway spruce is the fastest growing species followed by white spruce, black spruce and balsam fir while red spruce performed the worst (Figure 9). In addition to improving survival, site preparation also appears to improve height growth as controls did consistently poorer than the rest. Areas which received a Velpar® treatment tended to have the tallest trees (Figure 9). Survival and height data concerning this trial is available in appendices 2&3.

Table 4. Mean percent survival by species and site preparation treatment at Paradise 10 years after planting.

Species	Treatment	Mean % Survival
Norway Spruce	Control	0 a
White Spruce	Control	0 a
Norway Spruce	Fertilizer Bag	3 a
Norway Spruce	Brush Blankets	4 a
Black Spruce	Fertilizer Bag	7 a
Red Spruce	Velpar®	7 a
Red Spruce	Control	8 a
Black Spruce	Velpar® + Fertilizer Bag	11 ab
Balsam Fir	Fertilizer Bag	11 ab
Black Spruce	Control	12 ab
Red Spruce	Fertilizer Bag	12 ab
White Spruce	Fertilizer Bag	15 ab
Norway Spruce	Velpar® + Fertilizer Bag	17 abc
Red Spruce	Velpar® + Fertilizer Bag	19 abcd
Balsam Fir	Control	19 abcd
Balsam Fir	Brush Blankets	19 abcd
White Spruce	Brush Blankets	20 abcd
Norway Spruce	Velpar®	21 abcd
Red Spruce	Brush Blankets	24 abcde
White Spruce	Velpar®	35 bcde
Balsam Fir	Velpar®	41 cde
Black Spruce	Velpar®	44 de
White Spruce	Velpar® + Fertilizer Bag	48 e
Balsam Fir	Velpar® + Fertilizer Bag	49 e
Black Spruce	Brush Blankets	49 e
Means that do not have a letter in common are significantly different (Fisher's least significant difference, $P < 0.01$)		

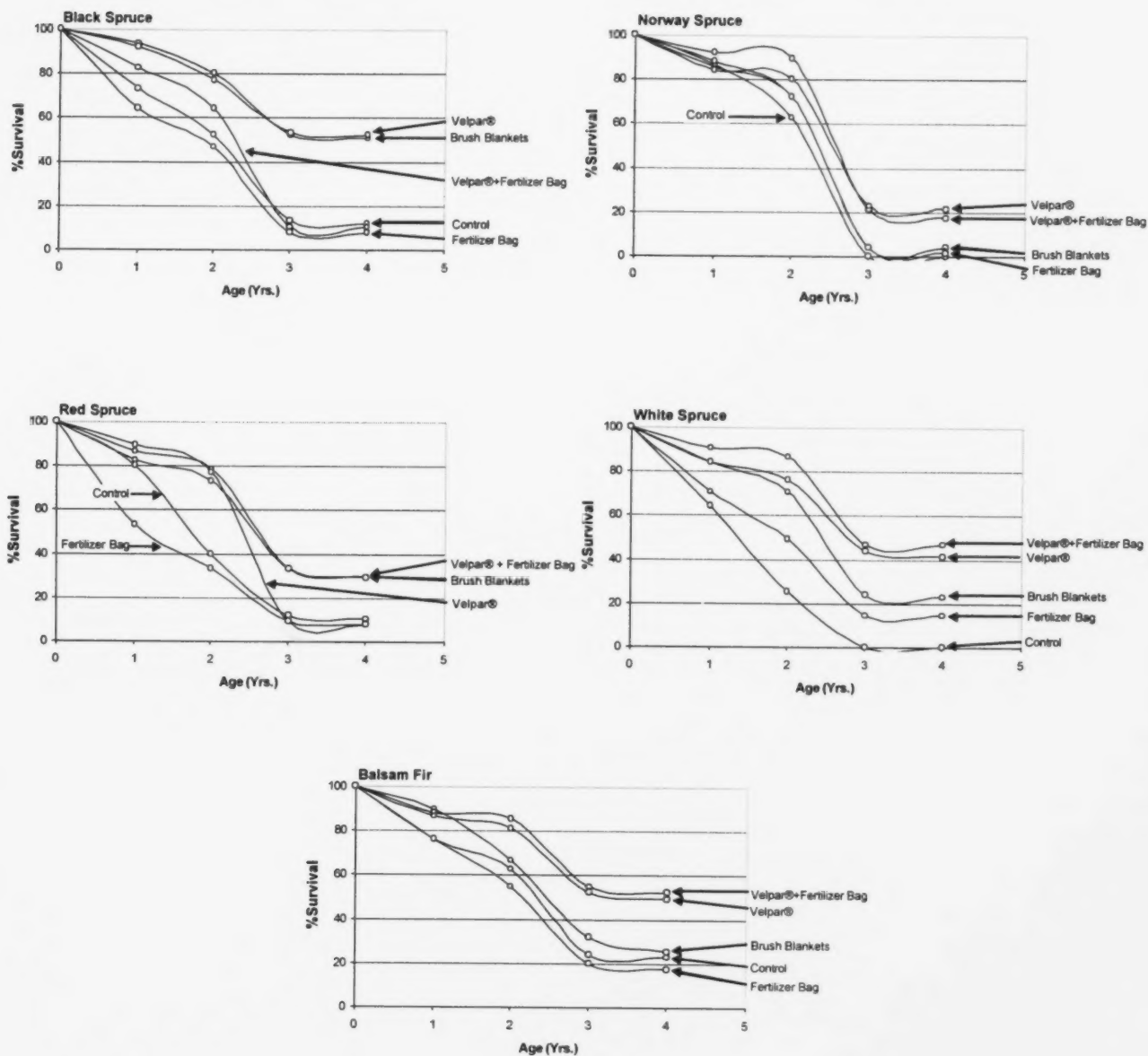


Figure 8. Planted seedling survival of the various species/site preparation combinations at Paradise. (Survival data 10 years after planting is available in Appendix 2. This data was not graphed as it detracts from the initial trends which are the most revealing. 10-year survival levels remains approximately the same as they are in year 4).

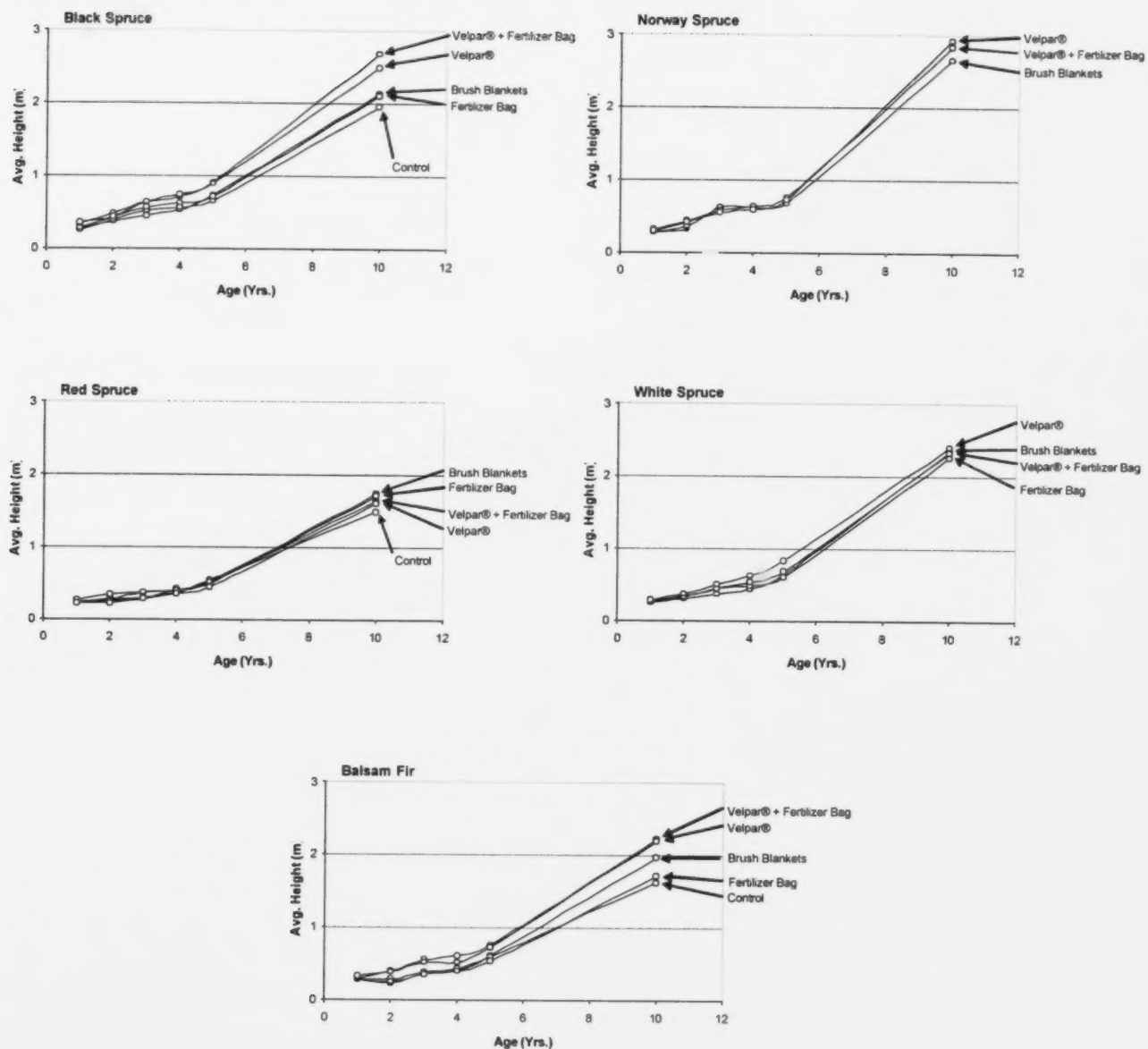


Figure 9. Average planted tree height of the various species/site preparation combinations at Paradise (Missing treatment categories means there are no trees left in that category).

7.0 Permanent Sample Plots

The NSDNR has collected data from several plantations originating from old fields as part of the province's growth and yield program. This historical data, in the form of permanent sample plots, provides a long term estimate of the growth potential of different species originating from afforested old fields in Nova Scotia.

The following table provides background information on old-field origin stands containing permanent sample plots which have been or still are monitored by the NSDNR. The species, original planted spacing, ownership, and general location (Figure 1) are provided in Table 5. The PSP data can be found in Appendix 4, which is organized by species followed by location.

Table 5. PSPs within stands originating from old fields organized by location.

Permanent Sample Plots				
Location	PSP #	Species	Spacing	Ownership
Abercrombie	9100	Japanese larch	3.0m	Private
Blue Mountain	7804	Norway spruce	2.1x2.4m	Crown
Caledonia	8433	Norway spruce	2.4m	Crown
	8434	"	"	"
	8435	"	"	"
	8436	"	"	"
	8437	"	"	"
	8438	"	"	"
Centerdale	8442	Norway spruce	1.2x1.5m	Private
	8443(Cut)	Red pine	"	"
Debert	7918	Red pine	1.5m	Crown
	7921	Red pine	1.8m	"
	8429	Red spruce	1.4m	"
Debert River Road	8903	Norway spruce	2.1m	Private
Dryden Lake	8439	Red pine	1.5x1.8m	Private
	8440	Norway spruce	1.5m	"
	8441	White spruce	1.5m	"
Earltown	8206	Norway spruce	1.8m	Private
	9210	"	"	"
Fox Harbour	9109	White spruce	1.9m	Private
	9118	White pine	"	Crown
Glencoe	8424	White spruce	1.8m	Crown
Glengarry	8444	Red pine	1.5x1.8m	Private

Landsdowne	8906	White spruce	1.8m	Private
	8907	Red spruce	"	"
Lochaber Mines	7905	Red spruce	2.4m	Crown
Lorne	8445	Scots pine	2.7x3.3m	Private
	8446	Norway spruce	1.5x2.1m	"
	8524	White pine	1.5x1.8m	"
MacLeod Settlement	8203	Black spruce	1.8m	Crown
Manganese Mines	8345	White spruce	1.8m	Private
	8346	"	"	"
Middle River	8426	White spruce	1.8m	Crown
	8427	White & red	"	"
	8428	spruce	"	"
	9309	Red spruce Red pine	"	"
Mt. Thom	0401	White spruce	1.8m	Crown
	0402	"	"	"
Reid Road	8902	Norway spruce	1.9m	Private

7.1 Growth of the Different PSP's

Species for which there is PSP data include black spruce (*Picea mariana* (Mill.) BSP), Norway spruce (*Picea abies* (L.) Karst.), red spruce (*Picea rubens* Sarg.), white spruce (*Picea glauca* (Moench) Voss), red pine (*Pinus resinosa* Ait.), Scots pine (*Pinus sylvestris* L.), white pine (*Pinus strobus* L.), and Japanese larch (*Larix kaempferi* (Lamb.) Carriere). This report is a synthesis of available data on old field origin stands as per Nova Scotia's database and the species presented do not reflect any particular preference of the Nova Scotia Department of Natural Resource.

Growth measurements such as mean annual increment (MAI) are likely to be used as an approximation for determining carbon uptake. Total MAI is a closer approximation of carbon uptake than merchantable MAI as tree biomass, regardless of merchantability, has the ability to sequester carbon. For this reason, total MAI is the primary unit of measurement used for the purposes of this report to approximate growth to carbon uptake. It should be noted that total MAI excludes the non-bole portions of the tree. Merchantable MAI would still be of particular interest to land owners who's intention it would be to harvest these plantations.

Table 6 lists the range in peak growth of the PSPs for each species. As a word of caution, one should keep in mind that Table 6 is not comprehensive enough to fully categorize a species' growth potential. Several species (black spruce, Scots pine, Japanese larch) are only represented by one PSP in one location, so one cannot make any definitive conclusions about these species. This is especially true of black spruce, where the poor growth of this one PSP may not be indicative of this species' growth potential on old fields. In addition, PSPs are established in areas of high stocking in aims of representing growth at full stocking. Therefore, the average condition across the entire plantation is likely less than what is presented.

Table 6. The range in peak growth represented by total MAI and merchantable MAI for each species across all PSPs.

Species	# PSP's	# of Different Locations	Mean Annual Increment (m ³ /ha/yr)	
			Merchantable	Total
Norway spruce	14	8	5.1 - 14.4	5.9 - 15.4
Red pine	6	5	8.5 - 12.1	9.2 - 13.3
Japanese larch	1	1	11.9	12.7
Scots pine	1	1	11.5	11.9
White pine	2	2	9.9 - 10.1	10.8 - 11.0
Red spruce	4	4	5.2 - 9.8	6.1 - 11.0
White spruce	9	7	3.9 - 6.8	5.2 - 8.6
Black spruce	1	1	5.4	6.1

Of all the species, a plantation of Norway spruce in Lorne, Nova Scotia had the highest recorded growth rate of 15.4 m³/ha/yr, followed by red pine with a maximum total MAI of 13.3 m³/ha/yr. Japanese larch reached a maximum total MAI of 12.7 m³/ha/yr at 22 years of age. A growth rate of 11.9 m³/ha/yr was recorded for Scots pine. White pine shows promise with growth rates reaching 11m³/ha/yr. The highest growth rate recorded for red spruce was 11m³/ha/yr at Debert and for white spruce the highest growth rate was 8.6 m³/ha/yr at Landsdowne (Table 6, Figure 10).

For many of the older plantations there are no records of when they were established. In order to determine plantation age, trees were cored 1 ft above ground. The age determined in this way is referred to as stump age.

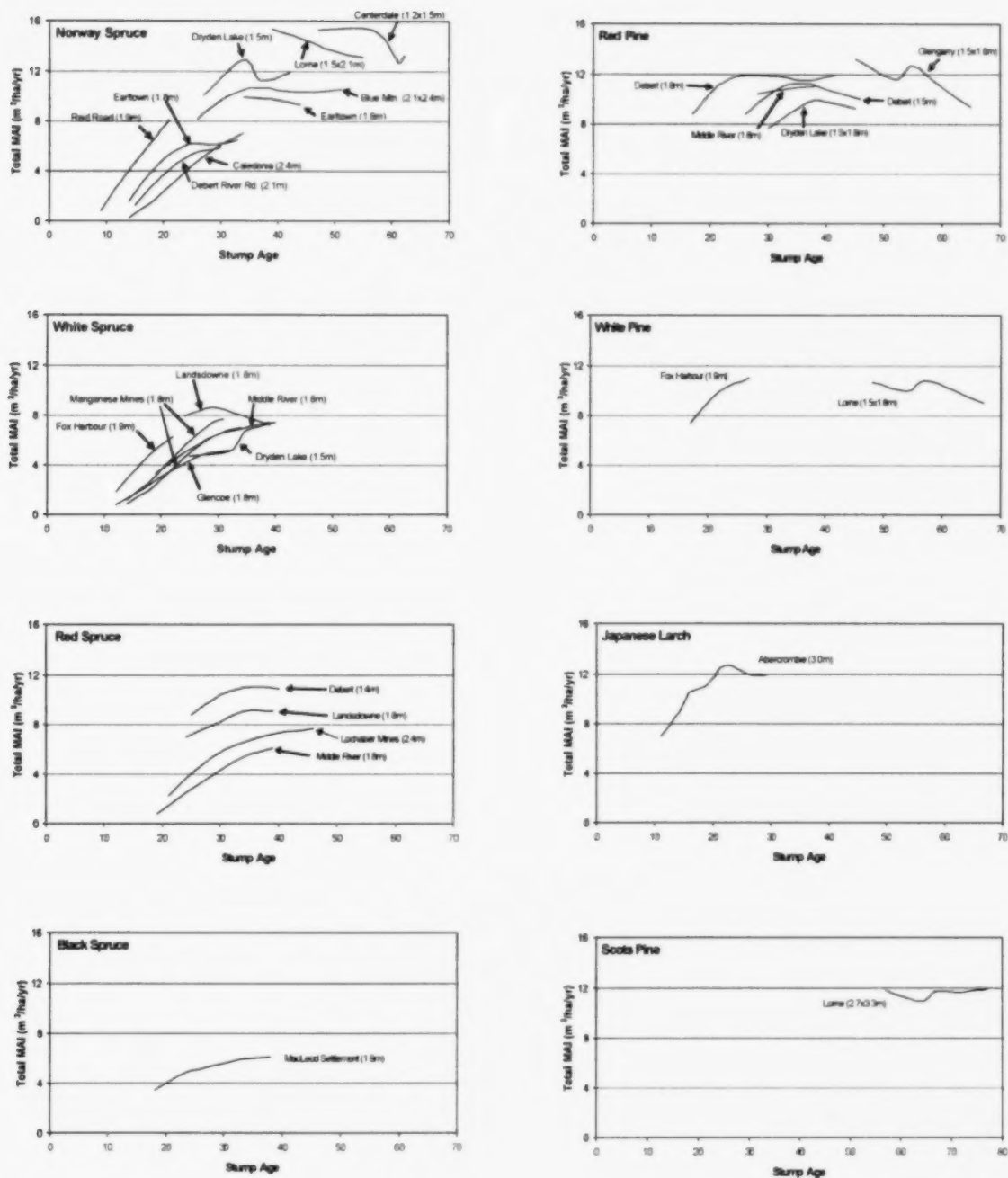


Figure 10. Total mean annual increment ($\text{m}^3/\text{ha}/\text{yr}$) by species, location and the plantation's original spacing in parenthesis.

7.2 Comparison of Different Species at the Same Location

The best way to compare the growth of different species is to compare plantations that are adjacent to each other in order to minimize growth differences attributable to site variation. Locations where different species were planted adjacent to each other include Debert, Dryden Lake, Landsdowne, Lorne, and Middle River.

7.2.1 Debert

Debert is located in central Nova Scotia close to the Bay of Fundy. Three separate plantations, one red spruce and two red pine, were planted on sandy loam between the late 50's and early 60's at spacings ranging from 1.4m-1.8m. The PSPs of the different plantations are within 750m. The red pine plantation with a spacing of 1.8m outperformed the other two plantations early on, however the other two plantations catch up later in their development. The red pine plantation at 1.5m spacing and the red spruce plantation developed in much the same way (Figure 11).

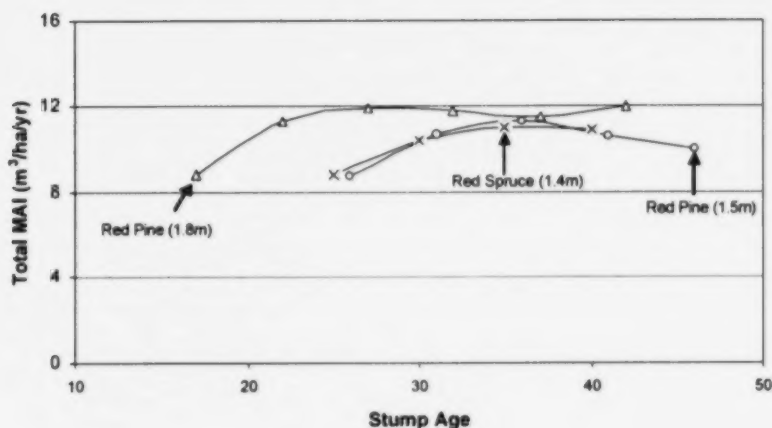


Figure 11. The total mean annual increment (MAI) of red pine and red spruce plantations at Debert. The original planted spacing is in parenthesis.

7.2.2 Dryden Lake

Dryden Lake is located in central Nova Scotia. Plantations of Norway spruce, white spruce and red pine were all planted adjacent to each other between the years of 1957-1960 at very similar densities on a loamy sand site with excessive drainage and low fertility. The PSPs of the different plantations are within 240m. Norway spruce and red pine both substantially outperformed white spruce, at times growth rates of Norway spruce were more than double that of white spruce (Figure 12). Norway spruce outperformed red pine despite the fact that the Norway spruce plot suffered greater mortality which reduced the plot's density below that of the red pine from 37 - 42 years of age (Appendix 4).

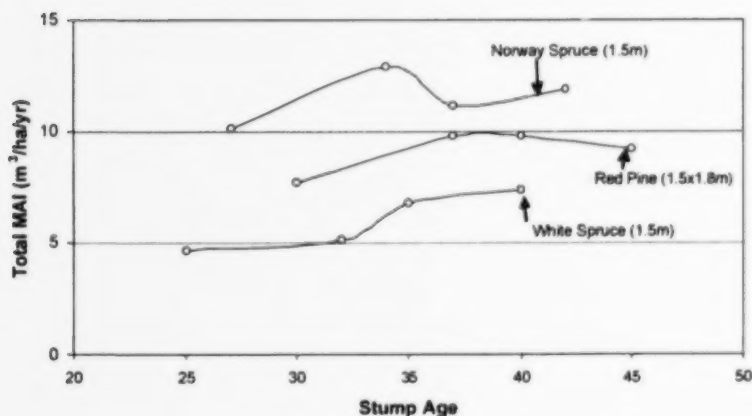


Figure 12. The total mean annual increment (MAI) of white spruce, Norway spruce and red pine plantations at Dryden Lake. The original planted spacing is in parenthesis.

7.2.3 Landsdowne

Landsdowne is located in central Nova Scotia. Two plantations, one white spruce and one red spruce, were planted around 1966 at 1.8m spacing on well drained sandy loam. The PSPs of the different plantations are within 70m. Initially, the white spruce plantation was performing better than the red spruce plantation until approximately 32 years of age, after which point the red spruce surpassed the white spruce. Planted red spruce starts out relatively slow compared to other species, however over time its growth rate increases. Another possible contributing factor to this trend is that the white spruce PSP incurred a greater loss of stems from its initial density compared to the red spruce PSP (Figure 13).

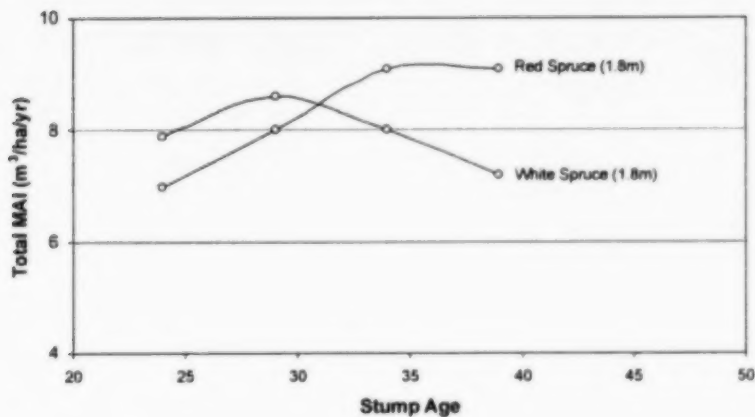


Figure 13. The total mean annual increment (MAI) of white spruce and red spruce plantations at Landsdowne. The original planted spacing is in parenthesis.

7.2.4 Lorne

Lorne is located in central Nova Scotia. At this site there is a Norway spruce, a white pine, and a Scots pine plantation within close proximity to each other on well drained silt loam. All PSPs within the different plantations are within 300m. The Norway spruce and the white pine plantations were planted in 1945 and 1935 respectively at relatively similar densities (1.5x2.1m and 1.5x1.8m). The Scots pine plantation was planted around 1927 at a spacing of 2.7x3.3m and is therefore less comparable. PSPs were not established in these stands until later in their development, therefore the early growth and development of these stands is unavailable. It is likely that the peak growth potential of these stands was achieved prior to the establishment of these PSPs, this is especially true of the white pine and Scots pine plantations. Nevertheless, the information presented still provides some insight into the growth potential of these species. The Norway spruce plantation substantially outperformed the white pine plantation during the time frame in which they overlap. The Scots pine plantation outperformed the white pine plantation during the time frame in which they overlap, however these two plantations are not entirely comparable due to the large difference in initial spacing (Figure 14).

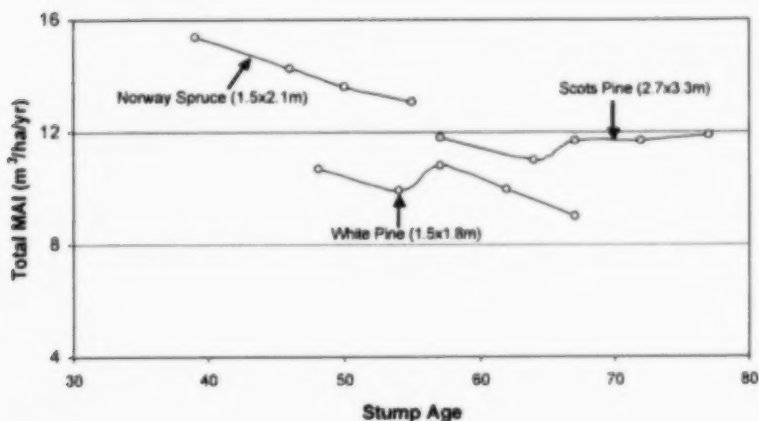


Figure 14. The total mean annual increment (MAI) of white pine, Scots pine and Norway spruce plantations at Lorne. The original planted spacing is in parenthesis.

7.2.5 Middle River

Middle River is located on Cape Breton Island. Plantations of white spruce, red spruce, red pine, and white/red spruce were planted around the year 1965 on well drained silt loam at a spacing of 1.8m. The PSPs of the different plantations are all within 300m of each other. Red pine substantially outperformed all spruce plantations. The pure white spruce plantation out-performed both the red spruce and the combination white/red spruce plantations, however, over time it would appear that the gap between them is decreasing. Initially, planted red spruce starts out relatively slow, however over time its growth rate increases. The red spruce plantation, though it was originally planted pure, contains a minor proportion of white spruce due to ingrowth. Thus, the red spruce plantation with white spruce ingrowth and the white/red spruce plantation both contain a similar species composition and have logically developed in much the same way (Figure 15).

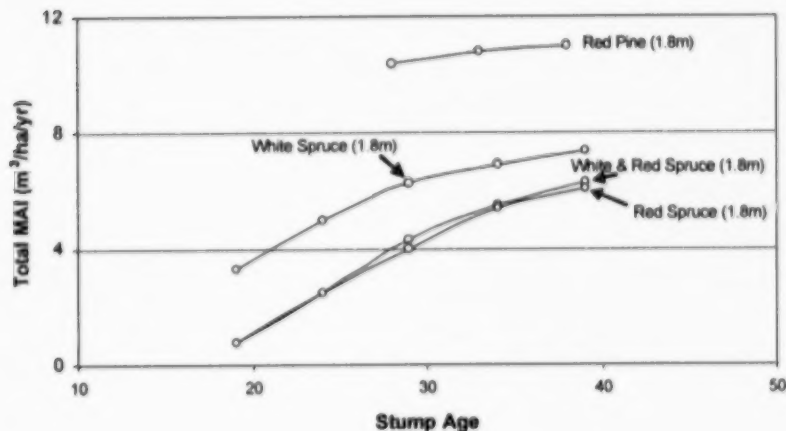


Figure 15. The total mean annual increment (MAI) of red pine, white spruce, red spruce and white/red spruce plantations at Middle River. The original planted spacing is in parenthesis.

8.0 Discussion

One of the most critical periods in plantation forestry is the establishment phase. The presence of significant competition in a plantation can retard growth and/or cause mortality. In old fields the most common competition is grass and sedge species. Grass cover in old fields often tends to be very dense and can effectively choke out planted seedlings by competing both above ground and below ground for light, moisture and nutrients. Some form of site preparation and/or release treatment is likely necessary when afforesting old fields as the competition needs to be reduced long enough for the planted seedlings to become established. Once planted seedlings have gained a height position comparable to that of the competition the seedlings will likely require no further assistance.

Plantations established in old fields by the Nova Scotia Department of Natural Resources achieved better survival and usually better height growth with site preparation. Velpar® herbicide treatments were usually the most successful. Site preparation by plow has also been proven effective when Velpar® resistant competition is present. Plowing also provides a good alternative where the use of herbicides are a concern. When planting on plowed sites it was deemed more advantageous to plant on the mound than in the furrow. Brush blankets appear to provide some benefit in terms of survival, however the results of the one study at Paradise are not conclusive enough to make any definitive recommendations regarding their use. Brush blankets may be a good alternative when the use of herbicides are a concern, but on the down side brush blankets are difficult and time consuming to put in place. The controls tended to have the poorest survival and the use of fertilizer did not provide any additional benefits.

Research efforts in Nova Scotia with regards to plantation establishment in old fields have mainly focused on site preparation. With the level of competition that is present in some old fields, site preparation alone may not be enough to secure survival of planted seedlings, a further release treatment a few years after planting may be necessary. The furrow versus mound plow site preparation trial (Section 6.2: Figure 4 & 5) received a follow-up release treatment of Roundup® 2 years after planting and maintained very good survival. Von Althen (1972) reported satisfactory survival of black locust (*Robinia pseudoacacia*), white ash (*Fraxinus americana*), silver maple (*Acer saccharinum*) and white pine in an afforestation study only when plowing or disking was accompanied by a herbicide treatment, neither treatment produced the desired results in isolation. Monitoring of plantations periodically after planting during this critical establishment phase could help identify areas that are in need of further release treatments.

When choosing which species to plant one must consider a multitude of factors not just a species' growth potential, although this is a major consideration. Other factors include choosing a species suited to the specific site conditions in question and also in the larger sense suited to Nova Scotia's climate. In addition, the future marketability of products produced from these fast-growing plantations must be taken into consideration and the particular susceptibility of the different species to damaging agents.

Exotics can have above-average growth potential, but may not be appropriate for Nova Scotia's forest industry. In addition, some exotics tend to be more susceptible to damaging agents. These factors would need to be explored in more detail prior to undertaking an afforestation program with any exotic species. The most promising exotic is Norway spruce, which has been widely planted throughout this province and has been largely accepted by industry as a marketable species.

A balanced approach of planting the appropriate species to the specific site conditions is likely to produce the best results due to greater survival, even if that species is not the fastest-growing. This being said, red pine and Norway spruce may be good candidates for the afforestation of old fields in Nova Scotia where site conditions permit. Both of these species have demonstrated above average growth potential and the products produced from these plantations are likely to be accepted in Nova Scotia's marketplace. Based on the success of past plantations both species have proven their ability to thrive and grow in old field conditions in Nova Scotia's climate.

Red pine is best suited for growth on coarse textured soils with good drainage. This species is susceptible to shoot blight (*Sirococcus conigenus*) in Nova Scotia, especially on humid shady sites. Foggy coastal area and areas that receive a lot of shade, such as steep north or west facing slopes and shaded sites north and west of a tall stand of trees, should not be planted with red pine due to the increased risk of infection (Guscott and George 2005).

According to the literature, Norway spruce attains its best growth on medium textured, fresh to moist loam and sandy loam sites (Haines 1974). Experience in Nova Scotia has shown that Norway spruce has the ability to grow well on a wide variety of sites (NSDLF 1990a). This species tolerates a wide range of nutritional regimes, but requires a high degree of soils moisture especially in the upper horizons due to its shallow root system. As a result, Norway spruce does not do as well on sites with abundant grass, sedge or ericaceous vegetation which have extensive root mats close to the surface (NSDLF 1990a). The root systems of these species directly compete with Norway spruce for available moisture until increasing shade from expanding tree crowns reduce their abundance. In instances where there is heavy competition, weed control is likely necessary. It can be difficult to establish a Norway spruce plantation in an old field as was the case at Bridgetown, Springfield, and Paradise, however once it does become established its growth potential far exceeds our native spruces (NSDLF 1990a). Norway spruce is susceptible to browsing in the early stages of development and is also susceptible to white pine weevil (*Pissodes strobi*). All these potential problems should be taken into consideration in the management of this species.

Combination plantations of Norway spruce and red pine are not advisable as red pine grows very quickly in the beginning resulting in suppression of the Norway spruce component of the plantation (NSDLF 1990a).

White spruce is also a good candidate for old field plantings. It naturally seeds into old fields in Nova Scotia and is therefore adapted to open grown conditions. White spruce tended to have inferior growth compared to some of the other species, however it did tend to have good early survival in the trials at Bridgetown, Springfield and Paradise and may be a likely choice in situations where competition is severe. Old field white spruce stands tend to decline relatively early and therefore this species may not be the best choice where longer rotations and/or commercial thinning is desired. The use of improved white spruce stock should be explored further. Preliminary reports suggest that a 6% increase in stand volume can be achieved with the use of improved stock (Bateman 2004).

White pine naturally seeds into old fields in Nova Scotia, predominantly in the western region, and therefore makes a logical choice for afforestation. ~~it displays good growth potential and may be a~~ good candidate where site conditions permit. White pine grows best on coarse textured soils with good drainage. This species is prone to weevil and blister rust (*Cronartium ribicola*) and precautions should be taken to reduce the risk of such infections. Open-grown white pine tends to be very branchy, and unlike red pine it does not naturally self prune, so this species will likely require pruning later in its development to realize full market potential. Jack pine and Scots pine, although they both have good growth potential, tend to have form problems which may limit their use.

The species listed within this report were selected based solely on the availability of information and by no means should preclude the use of other species not listed. The data presented is largely based on historical plantations and is therefore a reflection of past species/market trends where conifers dominated. There are significant information gaps within this report such as the sparse or non-existent data on the performance of common conifers such as balsam fir, black spruce, white pine and jack pine on old fields in Nova Scotia. Also lacking is data on the potential use of hardwoods to afforest old fields.

Afforestation of marginal agricultural land would provide the opportunity to not only reduce atmospheric carbon dioxide through forestry, but also has the added benefit of meeting some of Nova Scotia's future fibre needs through these plantations, thereby reducing the demands placed on Nova Scotia's natural forests. In addition, there are other benefits associated with the potential establishment of these plantations such as wildlife habitat, erosion reduction and improved water quality, storm and spring run-off moderation and employment opportunities.

9.0 Literature Cited

Bateman, L.A. 2004. Modeling tree improvement gains: A review of the strategic impact of the Neenah Paper Tree Improvement Program. Presentation to Nova Scotia Tree Improvement Working Group. Neenah Paper, Nova Scotia.

Government of Canada 2005. Project green - Moving forward on climate change: A plan for honouring our Kyoto commitment. Government of Canada. Available on-line at <http://www.climatechange.gc.ca>

Guscott, B. and K. George. 2005. Sirococcus shoot blight (red pine shoot blight). Nova Scotia Department of Natural Resources, Integrated Pest Management, Insectary Notes May/June 2005.

Haines, D.Y. 1974. The introduction of Norway spruce (*Picea abies* (L.) Karst.) to the Maritimes. Thesis. BScF. University of New Brunswick, 52p.

Intergovernmental Panel on Climate Change (IPCC) 2000. Land use, land-use change, and forestry. Cambridge University Press, UK. Pp 375.
Available on-line at <http://www.ipcc.ch/pub/srlulucf-e.pdf> (accessed July 2005).

McCully, K. and K. Jensen. 2005. Wild lowbush blueberry IPM: Weed Management Guide. New Brunswick Department of Agriculture, Fisheries and Aquaculture. Fredericton, New Brunswick. Available on-line at <http://www.gnb.ca/0171/10/017110020-e.pdf>

McCully, K., K. Jensen and G. Sampson. 1996 revised. Velpar and Pronone 10G for weed control in wild blueberries. New Brunswick Department of Agriculture, Fisheries and Aquaculture. Fredericton, New Brunswick.
Available on-line at <http://www.gnb.ca/0171/10/0171100030-e.asp>

NSDLF. 1990a. Norway spruce: Growth potential for Nova Scotia. Nova Scotia Department of Lands and Forests, Forest Research Report No. 24, 8pp.

NSDLF. 1990b. Planting on furrows and mounds: 10-year results. Nova Scotia Department of Lands and Forests, Forest Research Report No. 20, 3pp.

NSDNR. 1992. Yields of selected older forest plantations in Nova Scotia. Nova Scotia Department of Natural Resources, Forest Research Section Forest Research Report No 35. 25pp.

NSDNR. 1993. Forestry Field Handbook. Forest Research Section, Nova Scotia Department of Natural Resources. 43pp.
Available on the internet @ <http://www.gov.ns.ca/natr/forestry/handbook/cover.htm>

NSDNR. 1994. Photo interpretation specifications. Forests Resources Planning and Mensuration Division, Nova Scotia Department of Natural Resources.

UNFCCC 2005. Decisions concerning land use, land-use change and forestry, and matters relating to Article 3, paragraph 14, of the Kyoto Protocol. Compendium of draft decisions forwarded for adoption by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol at its first session. FCCC/KP/CMP/2005/3/Add.1. United Nations Framework Convention on Climate Change, Nov 28 to Dec 9, 2005, Montreal.
Available on the internet @ <http://unfccc.int/resource/docs/2005/cmp1/eng/03a01.pdf>

Von Althen, F.W. 1972. Eight-year results of an afforestation study. *The Forestry Chronicle* 48:325-326

West, R.C. 1984. A directory of selected older Maritimes plantations. Canadian Forestry Service, Maritimes Forest Research Centre, Fredericton, New Brunswick. Information Report M-X-151. 101pp.

Appendix 1: Bridgetown & Springfield

Survival (%)

Age	White Spruce / Control						White Spruce / Plow						White Spruce / Velpar®					
	Bridgetown			Springfield			Bridgetown			Springfield			Bridgetown			Springfield		
	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.
2	55	57	83	65	79	90	88	86	69	63	84	72	96	90	91	92	77	92
5	37	42	80	53	65	80	74	73	63	60	73	65	88	82	63	78	68	85
10	36	41	80	52	63	76	64	68	60	58	72	63	87	80	56	74	65	84

Age	Norway Spruce / Control						Norway Spruce / Plow						Norway Spruce / Velpar®					
	Bridgetown			Springfield			Bridgetown			Springfield			Bridgetown			Springfield		
	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.
2	57	54	89	67	64	88	83	78	73	57	92	74	70	85	81	79	67	96
5	19	31	69	40	24	21	18	21	46	45	33	41	31	50	52	44	26	43
10	13	29	64	35	20	14	13	16	36	37	28	34	28	46	47	40	17	38

Average Height (cm)

Age	White Spruce / Control						White Spruce / Plow						White Spruce / Velpar®					
	Bridgetown			Springfield			Bridgetown			Springfield			Bridgetown			Springfield		
	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.
2	41	40	38	40	33	36	35	35	33	33	35	34	28	31	31	30	37	42
5	68	78	88	78	54	56	57	56	67	65	82	71	50	61	55	55	78	94
10	229	267	316	271	167	198	180	182	189	235	251	225	200	211	212	208	234	308

Age	Norway Spruce / Control						Norway Spruce / Plow						Norway Spruce / Velpar®					
	Bridgetown			Springfield			Bridgetown			Springfield			Bridgetown			Springfield		
	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.	Rep	Rep	Avg.
2	36	40	36	37	30	33	30	31	35	32	34	34	35	35	35	35	36	40
5	64	73	75	71	49	44	47	47	62	65	73	67	58	61	56	58	68	89
10	208	245	259	237	91	117	126	111	176	202	229	202	173	178	176	176	199	278

Rep = Replicate

Appendix 2: Paradise - Survival (%)

Black Spruce / Control				Black Spruce / Velpar®				Black Spruce / Velpar® + Fertilizer Bag				Black Spruce / Fertilizer Bag				Black Spruce / Brush Blanket				
Age	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	68	72	80	73	100	88	88	92	84	96	88	93	96	92	92	93				
2	24	64	68	52	76	68	88	77	48	84	60	64	80	72	88	80				
3	0	32	8	13	48	36	76	53	16	16	0	11	16	4	4	8				
4	0	32	4	12	48	36	72	52	16	16	0	11	16	4	4	8				
5	0	32	4	12	48	36	72	52	16	16	0	11	16	4	4	8				
10	0	32	4	12	44	24	64	44	16	16	0	11	12	4	4	7				
Norway Spruce / Control				Norway Spruce / Velpar®				Norway Spruce / Velpar® + Fertilizer Bag				Norway Spruce / Fertilizer Bag				Norway Spruce / Brush Blanket				
Age	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	76	84	100	87	92	72	88	84	88	100	88	92	88	84	92	88	92	80	84	85
2	48	52	88	63	88	64	88	80	80	100	88	89	80	76	60	72	88	52	76	72
3	4	0	0	1	36	16	20	24	4	28	32	21	0	0	12	4	4	0	8	4
4	4	0	0	1	32	16	20	23	4	20	28	17	0	0	4	1	4	0	8	4
5	4	0	0	1	28	16	20	21	4	20	28	17	0	0	4	1	4	0	8	4
10	0	0	0	0	28	16	20	21	4	20	28	17	0	0	4	1	4	0	8	4
Red Spruce / Control				Red Spruce / Velpar®				Red Spruce / Velpar® + Fertilizer Bag				Red Spruce / Fertilizer Bag				Red Spruce / Brush Blanket				
Age	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	76	92	72	80	96	92	80	89	88	92	80	87	76	76	96	83				
2	20	56	44	40	76	88	68	77	80	80	76	79	44	24	32	33	64	64	92	73
3	0	8	28	12	0	20	8	9	12	52	36	33	0	8	32	13	28	28	44	33
4	0	4	28	11	0	20	4	8	8	48	32	29	0	4	32	12	20	28	40	29
5	0	4	24	9	0	20	4	8	8	44	24	25	0	4	32	12	20	28	40	29
10	0	4	20	8	0	20	0	7	8	28	20	19	0	4	32	12	20	24	28	24
White Spruce / Control				White Spruce / Velpar®				White Spruce / Velpar® + Fertilizer Bag				White Spruce / Fertilizer Bag				White Spruce / Brush Blanket				
Age	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	76	48	68	64	88	80	84	84	92	96	84	91	80	80	92	84				
2	24	16	36	25	80	68	80	76	80	96	84	87	24	64	60	49	48	72	92	71
3	0	0	0	0	72	20	40	44	40	36	68	48	4	16	24	15	24	4	44	24
4	0	0	0	0	68	20	36	41	40	36	68	48	4	16	24	15	24	4	44	24
5	0	0	0	0	64	20	36	40	40	36	68	48	4	16	24	15	16	4	44	21
10	0	0	0	0	56	16	32	35	40	36	68	48	4	16	24	15	16	4	40	20
Balsam Fir / Control				Balsam Fir / Velpar®				Balsam Fir / Velpar® + Fertilizer Bag				Balsam Fir / Fertilizer Bag				Balsam Fir / Brush Blanket				
Age	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	92	68	68	76	100	72	88	87	84	92	88	88	76	72	80	76	92	88	88	89
2	88	48	52	63	100	72	72	81	84	92	80	85	60	40	64	55	68	72	60	67
3	36	12	24	24	52	52	52	52	52	44	68	55	20	4	36	20	40	32	24	32
4	36	12	20	23	48	52	48	48	48	40	68	52	16	4	32	17	32	28	16	25
5	36	12	20	23	44	48	44	45	44	40	68	51	12	4	32	16	32	28	12	24
10	28	12	16	19	36	48	40	41	44	40	64	49	8	0	24	11	28	24	4	19

Appendix 3: Paradise - Average Height (cm)

Appendix 3. Paradise – Average Height (cm)

Age	Black Spruce / Control			Black Spruce / Velpar®			Black Spruce / Velpar® + Fertilizer Bag			Black Spruce / Fertilizer Bag			Black Spruce / Brush Blanket			
	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	14	26	35	25	36	36	37	36	39	37	28	35	33	25	27	28
2	43	32	43	39	40	41	49	43	45	52	45	47	48	44	37	43
3	-	51	52	52	56	69	68	64	59	68	-	64	57	49	64	57
4	-	55	59	57	66	79	80	75	66	76	-	71	59	57	71	62
5	-	70	61	66	79	93	95	89	84	98	-	91	69	67	79	72
10	-	242	150	196	275	214	261	250	267	268	-	268	206	162	265	211
Age	Norway Spruce / Control			Norway Spruce / Velpar®			Norway Spruce / Velpar® + Fertilizer Bag			Norway Spruce / Fertilizer Bag			Norway Spruce / Brush Blanket			
	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	32	22	31	28	27	35	28	30	27	36	32	32	32	32	36	33
2	24	34	36	31	44	44	39	42	42	47	43	44	35	37	36	36
3	*nh	-	-	-	51	57	59	56	55	67	54	59	-	-	47	47
4	*nh	-	-	-	51	61	65	58	56	76	62	65	-	-	57	57
5	*nh	-	-	-	61	82	78	74	69	91	69	78	-	-	74	74
10	-	-	-	-	278	276	322	292	269	312	271	284	-	-	*nh	-
Age	Red Spruce / Control			Red Spruce / Velpar®			Red Spruce / Velpar® + Fertilizer Bag			Red Spruce / Fertilizer Bag			Red Spruce / Brush Blanket			
	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	20	24	22	22	19	24	23	22	26	27	26	26	26	21	25	24
2	25	29	29	28	18	28	23	23	36	38	28	34	23	27	26	25
3	-	24	37	31	-	38	20	28	35	45	33	38	-	29	28	29
4	-	35	40	38	-	40	32	36	37	52	34	41	-	50	33	42
5	-	*nh	54	54	-	47	42	45	44	66	45	52	-	56	43	50
10	-	147	151	149	-	161	-	161	129	225	139	164	-	224	119	172
Age	White Spruce / Control			White Spruce / Velpar®			White Spruce / Velpar® + Fertilizer Bag			White Spruce / Fertilizer Bag			White Spruce / Brush Blanket			
	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	29	25	25	26	28	30	25	28	27	30	28	28	23	27	28	26
2	33	32	29	31	34	42	37	38	35	37	29	34	33	33	31	32
3	-	-	-	-	45	64	42	50	44	47	44	45	52	42	41	45
4	-	-	-	-	55	76	59	63	49	61	50	53	55	46	47	49
5	-	-	-	-	76	101	75	84	67	79	60	69	62	64	59	62
10	-	-	-	-	221	264	234	240	244	189	266	233	265	198	219	227
Age	Balsam Fir / Control			Balsam Fir / Velpar®			Balsam Fir / Velpar® + Fertilizer Bag			Balsam Fir / Fertilizer Bag			Balsam Fir / Brush Blanket			
	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.	Block 1	Block 2	Block 3	Avg.
1	27	28	28	28	32	29	36	32	31	30	30	30	26	28	29	28
2	28	27	28	28	43	36	39	39	42	41	40	41	29	20	27	25
3	37	42	39	39	56	50	49	52	54	59	52	55	40	*nh	32	36
4	40	47	43	43	48	53	54	52	60	72	51	61	37	*nh	44	41
5	55	73	50	59	71	80	70	74	78	86	64	76	54	*nh	53	54
10	168	152	168	163	190	223	247	220	211	194	260	222	169	-	175	172
*nh No height measurement taken at this time. All trees are dead in plot.																

*nh No height measurement taken at this time. - All trees are dead in plot

Appendix 4: PSPs

- LC: Land capability is a measure of site productivity and is explained in the Nova Scotia Forestry Field Handbook (NSDNR 1993).
- There is soil texture, drainage and past treatment information for only a portion of the PSPs.

Black Spruce

Location: MacLeod Settlement				Species: Black Spruce				Spacing: 1.8x1.8m				LC = 7.2				Texture: Sandy Loam				Drainage: Imperfect							
PSP#: 8203				Year Planted: c. 1964				Ownership: Crown				Basal Area (m2/ha)				Volume (m3/ha)				MAI (m3/ha/yr)				#Trees/Plot*			
Slump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sp.												
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Bs	EL											
18	9.2	11.3	14.2	7.0	7.4	8.5	2700	1440	90	18	15	1	62	38	4	3.4	2.1	0.2	0	30	92	6					
23	11.5	13.4	15.4	8.5	8.7	9.6	2610	1800	540	27	25	10	110	86	38	4.8	3.7	1.7	1	29	91	7					
28	13.1	15.0	16.0	9.7	9.9	10.1	2430	1800	1260	33	32	25	151	127	93	5.4	4.5	3.3	3	27	88	9					
33	14.4	16.4	17.0	10.7	10.9	11.0	2430	1800	1530	39	38	35	196	169	145	5.9	5.1	4.4	3	27	86	11					
38	15.9	16.9	18.1	11.7	11.8	11.9	2160	1890	1530	43	43	39	231	205	186	6.1	5.4	4.9	6	24	83	14					

*Plot size = 1/90 ha

*Plot size = 1/90 ha

Norway Spruce

Location: Blue Min.				Species: Norway Spruce				Spacing: 2.1x2.4m				Ownership: Crown				LC = 9.5				Texture: Sandy Loam				Drainage: Well				Site Prep: Plow	
PSP#: 7804				Year Planted: c.1954				Density (stems/ha)				Basal Area (m2/ha)				Volume (m3/ha)				MAI (m3/ha/yr)				#Trees/Plot*		% Sp.			
Stump Age		DBH (cm)		Height (m)		Total		Merch.		Saw.		Total		Merch.		Saw.		Total		Merch.		Saw.		Dead		Live		% Sp.	
26		168	172	185	116	117	119	1680	1600	1200	37	37	32	213	192	166	82	74	64	0	42							100	
31		184	186	199	141	142	144	1680	1640	1320	45	45	41	306	280	260	99	90	84	0	42							100	
36		199	201	212	157	158	160	1640	1600	1360	51	51	48	384	356	344	107	99	96	1	41							100	
41		219	219	226	177	177	178	1360	1360	1240	51	51	50	426	399	398	104	97	97	8	34							100	
46		225	225	232	188	188	189	1360	1360	1240	54	54	53	476	446	446	103	97	97	8	34							100	
51		235	235	243	200	200	201	1320	1320	1200	57	57	56	533	502	502	105	98	98	9	33							100	

*Plot size = 1/40 ha

*Plot size = 1/40 ha

Location: Caledonia				Species: Norway Spruce				Spacing: 2.4x2.4m				LC = 10.4				Texture: Sandy Loam				Drainage: Well							
PSP#: 8433				Year Planted: c. 1970				Ownership: Crown				Basal Area (m2/ha)				Volume (m3/ha)				MAI (m3/ha/yr)				#Trees/Plot*			
Stump Age		DBH (cm)		Height (m)		Density (stems/ha)		Total Merch. Saw		Total Merch. Saw		Total Merch. Saw		Total Merch. Saw		Total Merch. Saw		Total Merch. Saw		Dead		Live		% Spd			
14	38	0.0	0.0	38	0.0	0.0	1640	0	0	2	0	0	4	0	0	0.3	0.0	0.0	0	41	0	41	100				
19	86	10.2	0.0	6.9	7.6	0.0	1680	760	0	10	6	0	34	15	0	1.8	0.8	0.0	0	42	0	42	100				
24	123	13.0	15.8	10.2	10.4	11.4	1680	1440	240	20	19	5	100	79	20	4.2	3.3	0.8	0	42	0	42	100				
29	150	15.7	16.9	13.0	13.1	13.5	1640	1480	960	28	29	21	184	161	121	6.3	5.6	4.2	1	41	1	41	100				
34	171	17.9	18.2	15.3	15.4	15.4	1600	1440	1360	37	36	35	271	244	230	8.0	7.2	6.8	2	40	2	40	100				

*Plot size = 1/40 ha

*Plot size = 1/40 ha

Location: Caledonia			Species: Norway Spruce			Ownership: Crown			LC = 9.9			Texture: Sandy Loam			Drainage: Well																				
PSP#: 8434			Year Planted: c.1970			Spacing: 2.4x2.4m			Density (stems/ha)			Basal Area (m2/ha)			Volume (m3/ha)			MAI (m3/ha/yr)			#Trees/Plot*			% Sp.											
Stump Age			DBH (cm)			Height (m)			Total			Merch.			Saw.			Total			Merch.			Saw.			Dead			Live			Ns		
14	3.8	0.0	0.0	0.0	3.9	0.0	0.0	0.0	1920	0	0	2	0	0	0	0	0	0.3	0.0	0.0	0	48	100												
19	7.9	10.1	0.0	0.0	6.6	7.7	0.0	0.0	1920	560	0	9	4	0	0	0	1.6	0.5	0.0	0	48	100													
24	11.1	12.4	14.9	9.4	9.8	11.2	1920	1360	160	19	16	3	19	16	3	3	3.6	2.6	0.5	0	48	100													
29	13.3	14.4	15.9	12.1	12.3	13.0	1920	1520	920	27	25	18	27	25	18	157	127	90	5.4	4.4	3.1	0	48	100											
34	14.9	15.7	17.6	14.2	14.4	15.0	1920	1680	1080	33	32	26	33	32	26	229	198	160	6.7	5.8	4.7	0	48	100											

*Plot size = 1/40 ha

*Plot size = 1/40 ha

Location: Caledonia			Species: Norway Spruce			Ownership: Crown			LC = 11.1			Texture: Sandy Loam			Drainage: Well						
PSP#: 8435		Year Planted: c.1970	Spacing: 2.4x2.4m			Basal Area (m2/ha)			Volume (m3/ha)			MAI (m3/ha/yr)			#Trees/Plot*		% Spg.				
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Total Merch. Saw.		Total Merch. Saw.		Total Merch. Saw.		Total Merch. Saw.		Dead	Live					
14	4.1	0.0	0.0	4.1	0.0	0.0	2000	0	0	3	0	0	6	0	0	0	50	100			
19	8.4	10.7	0.0	7.3	7.9	0.0	2040	680	0	11	6	0	42	16	0	0	51	100			
24	11.3	12.5	15.6	10.2	10.5	11.3	2000	1520	320	20	19	6	102	76	26	4.3	3.2	1.1	1	50	100
29	13.8	15.0	17.1	13.3	13.6	14.1	1880	1520	840	28	27	19	182	154	108	6.3	5.3	3.7	4	47	100
34	15.8	16.9	18.4	15.4	15.6	15.9	1880	1600	1200	37	36	32	271	241	212	8.0	7.1	6.2	4	47	100

*Plot size = 1/40 ha

*Plot size = 1/40 ha

Location: Caledonia			Species: Norway Spruce			Ownership: Crown			LC = 9.9			Texture: Sandy Loam			Drainage: Well								
PSP#: 8436			Year Planted: c.1970			Spacing: 2.4x2.4m			Basal Area (m ² /ha)			Volume (m ³ /ha)			MAI (m ³ /ha/yr)			#Trees/Plot*			% Sp.		
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		Drainage: Well								
	Total	Merch.	Saw	Total	Merch.	Saw	Total	Merch.	Saw	Total	Merch.	Saw	Total	Merch.	Saw	Dead	Live	Ns					
14	3.6	0.0	0.0	3.3	0.0	0.0	1760	0	0	3	0	0	0.2	0.0	0.0	0	44	100					
19	8.1	10.1	0.0	6.9	7.7	0.0	1760	480	0	9	4	0	1.6	0.5	0.0	0	44	100					
24	11.4	12.0	15.4	10.0	10.1	11.3	1760	1480	160	18	17	3	3.7	2.6	0.5	0	44	100					
29	13.7	14.1	16.1	13.0	13.0	13.6	1760	1640	760	26	26	16	5.6	4.7	2.8	0	44	100					
34	15.6	16.1	17.1	14.2	14.2	14.5	1880	1560	1160	32	32	26	6.5	5.7	4.5	2	42	100					

*Plot size = 1/40 ha

*Plot size = 1/40 ha

Location: Caledonia			Species: Norway Spruce			Year Planted: c.1970		Spacing: 2.4x2.4m		Ownership: Crown		LC = 9.8		Texture: Sandy Loam		Drainage: Well		
PSP#: 8437		DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sp.		
Stump Age	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Dead	Live	Ns
14	4.0	0.0	0.0	3.8	0.0	0.0	1840	0	0	2	0	0	5	0	0	0	46	100
19	8.8	10.5	0.0	7.5	8.2	0.0	1840	880	0	11	8	0	42	21	0	0	46	100
24	12.0	12.8	15.4	10.5	10.6	11.5	1840	1520	360	21	19	7	108	82	28	4.5	3.4	100
29	14.1	14.7	16.2	12.5	12.7	13.3	1760	1560	960	27	26	20	167	141	100	5.8	4.9	100
34	16.1	16.5	17.8	13.9	14.1	14.5	1600	1480	1080	32	32	27	218	194	164	6.4	5.7	100

*Plot size = 1/40 ha

Location: Caledonia			Species: Norway Spruce			Year Planted: c.1970		Spacing: 2.4x2.4m		Ownership: Crown		LC = 9.2		Texture: Sandy Loam		Drainage: Well		
PSP#: 8438		Stump Age		DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		
		Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Dead	Live
14		3.3	0.0	0.0	3.4	0.0	0.0	2040	0	0	2	0	0	3	0	0	0	51
19		7.8	10.4	0.0	6.8	8.0	0.0	2040	360	0	10	3	0	35	8	0	0	51
24		11.2	11.7	15.0	9.9	10.2	11.4	2040	1720	120	20	18	2	98	70	8	0	51
29		13.2	13.6	15.3	11.8	11.9	12.5	2040	1880	760	28	27	14	162	132	63	0	51
34		14.7	14.9	16.3	13.7	13.7	14.2	2040	1960	1200	35	34	25	229	197	143	0	51

*Plot size = 1/40 ha

Location: Centerdale		Species: Norway Spruce				LC = 12.4		Texture: Sandy Loam		Drainage: Well		Site Prep: Nil										
PSP#: 8442	Year Planted: c.1937	Spacing: 1.2x1.5m		Ownership: Private		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sp.										
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Total Merch. Saw.		Dead		Live									
	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Ns	Ws								
47	21.0	22.0	23.5	22.0	22.2	22.5	2080	1880	1560	72	71	68	721	670	667	15.3	14.3	14.2	0	52	91	9
57	24.2	24.7	26.3	25.2	25.2	25.6	1680	1600	1360	77	77	74	869	818	818	15.2	14.4	14.4	16	42	96	4
61	26.0	26.0	27.5	25.3	25.3	25.6	1280	1280	1120	68	68	66	776	736	736	12.7	12.1	12.1	23	32	100	0
62	26.2	26.2	27.7	26.7	26.7	27.0	1280	1280	1120	69	69	67	826	782	782	13.3	12.6	12.6	23	32	100	0

*Plot size = 1/40 ha

Location: Debert River Road				Species: Norway Spruce				LC = 7.5				Texture: Sandy Loam				Drainage: Well			
PSP#: 8903				Year Planted: c.1974				Spacing: 2.1x2.1m				Ownership: Private							
Stump Age	DBH (cm)		Height (m)	Density (stems/ha)		Total Merch. Saw.	Basal Area (m ² /ha)		Volume (m ³ /ha)	MAI (m ³ /ha/yr)		#Trees/Plot*		% Spd.					
	Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.	Dead	Live	Ns					
15	6.7	10.0	0.0	5.2	5.8	0.0	2220	120	0	20	2	0	1.3	0.1	0.0	0	37	100	
20	10.7	11.7	14.9	7.3	7.5	8.9	2220	1680	120	73	51	7	3.7	2.6	0.4	0	37	100	
25	13.1	13.9	15.6	8.8	8.9	9.5	2220	1920	840	133	109	60	5.3	4.4	2.4	0	37	100	
30	14.7	15.4	16.6	9.5	9.6	10.0	2220	1980	1320	177	154	115	5.9	5.1	3.8	0	37	100	

*Plot size = 1/60 ha

Location: Dryden Lake				Species: Norway Spruce				LC = 12.1				Texture: Loamy Sand				Drainage: Excessive			
PSP#: 8440				Year Planted: c.1958				Spacing: 1.5x1.5m				Ownership: Private							
Stump Age	DBH (cm)		Height (m)	Density (stems/ha)		Total Merch. Saw.	Basal Area (m ² /ha)		Volume (m ³ /ha)	MAI (m ³ /ha/yr)		#Trees/Plot*		% Spd.					
	Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.	Dead	Live	Ns					
27	14.9	15.2	17.4	11.9	11.9	12.7	2700	2550	1350	274	238	171	10.1	8.8	6.3	0	54	100	
34	17.8	17.8	19.5	15.3	15.3	15.9	2400	2400	1750	439	400	362	12.9	11.8	10.6	0	48	100	
37	19.3	19.3	20.4	17.2	17.2	17.4	1740	1740	1440	416	384	360	11.2	10.4	9.7	15	29	100	
42	20.9	20.9	21.6	19.3	19.3	19.5	1620	1620	1440	499	465	456	11.9	11.1	10.9	17	27	100	

*Plot size = 1/55 ha

Location: Earlton				Species: Norway Spruce				PSP#: 8206				Year Planted: c.1968				Spacing: 1.8x1.8m			
																Ownership: Private			
Stump Age	DBH (cm)		Height (m)	Density (stems/ha)		Total Merch. Saw.	Basal Area (m ² /ha)		Volume (m ³ /ha)	MAI (m ³ /ha/yr)		#Trees/Plot*		% Spd.					
	Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.		Total	Merch. Saw.	Dead	Live	Ns					
14	5.8	9.7	0.0	5.1	5.9	0.0	3250	100	0	23	1	0	1.6	0.1	0.0	0	65	99	1
19	9.7	11.2	14.7	7.4	7.7	8.5	3100	1900	100	85	53	5	4.5	2.8	0.3	3	62	99	1
24	12.1	12.8	15.1	9.9	10.0	10.3	2600	2150	450	146	111	29	6.1	4.6	1.2	14	52	100	0
29	13.5	13.9	15.5	10.5	10.6	11.3	2400	2200	1050	178	147	85	6.1	5.1	2.9	18	48	100	0
33	14.4	14.9	15.8	12.3	12.4	12.6	2200	2000	1400	215	183	133	6.5	5.5	4.0	22	44	100	0

*Plot size = 1/50 ha

Location: Earltown		Species: Norway Spruce		PSP#: 9210		Year Planted: c. 1958		Spacing: 1.8x1.8m		Ownership: Private		LC = 8.6	
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		% Spd.
	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	
34	17.9	17.9	18.6	14.3	14.3	14.4	49	49	338	308	279	9.9	100
39	18.9	18.9	19.5	15.3	15.3	15.4	52	52	380	349	327	9.7	100
44	19.9	19.9	20.4	16.2	16.2	16.3	53	53	408	378	365	9.3	100

*Plot size = 1/50 ha

Location: Lorne		Species: Norway Spruce		PSP#: 8446		Year Planted: c. 1945		Spacing: 1.5x2.1m		Ownership: Private		LC = 12.7		Texture: Silt Loam		Drainage: Well		Site Prep: Nil	
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		% Spd.	Dead	Live	#Trees/Plot*	Ns	Bs	100
	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.							
39	19.1	19.8	21.2	21.1	21.3	21.8	62	61	602	554	539	15.4	100	0	36	0	36	100	100
46	22.9	22.9	23.6	24.4	24.4	24.6	59	58	658	619	619	14.3	100	12	24	12	24	100	100
50	23.2	23.5	24.5	24.7	24.8	25.1	61	60	679	639	639	13.6	100	22	36	22	36	100	100
55	23.8	24.1	24.9	25.7	25.8	26.0	62	62	721	679	679	13.1	100	23	35	23	35	100	100

*Plot size = 1/60 ha the first 2 years; 1/40 ha the last 2 years

Location: Reid Road			Species: Norway Spruce			PSP#: 8902			Year Planted: c.1980			Spacing: 1.9x1.9m			Ownership: Private			LC = 11.9			Texture: Sandy Loam			Drainage: Well	
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Spn.										
	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.		Saw.	Dead	Live							
9	4.0	0.0	0.0	4.0	0.0	0.0	2640	0	0	3	0	0	7	0	0	0.8	0.0	0.0	0	44	100				
14	9.0	10.1	0.0	7.0	7.3	0.0	2640	1380	0	17	11	0	58	25	0	4.1	1.8	0.0	0	44	100				
19	12.1	12.4	15.0	8.8	8.8	9.9	2580	2400	360	30	29	6	131	102	22	6.9	5.4	1.2	1	43	100				
21	13.2	13.4	15.3	9.9	10.0	10.7	2580	2460	1020	35	35	19	172	142	73	8.2	6.8	3.5	1	43	100				

*Plot size = 1/60 ha

Red Spruce

Location: Debert Species: Red Spruce

PSF#: 8429	Year Planted: c. 1958	Spacing: 1.4x1.4m		Ownership: Crown		LC = 8.1		Texture: (m3/ha)	Sandy Loam	Drainage: Well	Site Prep: Plow											
		DBH (cm)	Height (m)	Density (stems/ha)	Basal Area (m2/ha)	Volume (m3/ha)	MAI (m3/ha/yr)															
Slump Age	Total	Merch.	Saw	Total	Merch.	Saw	Total	Merch.	Saw	Dead	Live	% Spd.										
25	12.3	14.3	16.2	9.8	10.1	10.5	3700	2450	1350	44	39	28	219	173	117	88	6.9	4.7	1	74	95	5
30	14.3	15.5	17.5	11.5	11.7	12.2	3400	2750	1700	55	52	41	312	266	208	10.4	8.9	6.9	9	68	95	6
35	16.0	16.7	18.5	13.4	13.5	13.9	2950	2650	1800	59	58	49	385	340	284	11.0	9.7	8.1	19	59	93	7
40	17.1	17.5	19.3	14.4	14.4	14.8	2750	2600	1850	63	62	54	435	392	344	10.9	9.8	8.6	23	55	93	7

*Plot size = 1/50 ha

Location: Landsdowne Species: Red Spruce

PSP#: 9907		Year Planted: c.1966		Spacing: 1.8x1.8m		Ownership: Private		LC = 6.9		Texture: Sandy Loam		Drainage: Well		Site Prep: Plow							
Slump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sp.						
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live							
24	132	136	159	87	87	95	2760	2520	900	38	37	18	168	138	67	7.0	5.8	2.8	0	46	100
29	149	150	168	100	100	105	2640	2580	1500	46	46	33	233	205	148	8.0	7.1	5.1	2	44	100
34	164	164	180	117	117	119	2520	2520	1740	53	53	44	310	279	228	9.1	8.2	6.7	4	42	100
39	175	175	188	128	128	130	2340	2340	1800	57	57	50	355	324	279	9.1	8.3	7.2	7	39	100

*Plot size = 1/60 ha

Location: Lochaber Mines Species: Red Spruce

PSP#: 7905		Year Planted: c. 1959		Spacing: 2.4x2.4m		Ownership: Crown		LC = 6.0		Texture: Sandy Loam		Drainage: Well		Site Prep: Plow							
Slump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sap.						
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live		Rs					
21	8.9	10.9	14.6	6.0	6.4	7.6	2480	1240	80	15	12	1	49	28	4	2.3	1.3	0.2	0	62	100
26	12.0	13.4	16.9	8.2	8.3	9.2	2440	1840	400	28	26	9	117	93	40	4.5	3.6	1.5	1	61	100
31	14.3	15.1	17.0	10.2	10.2	10.5	2280	1960	1120	36	35	25	187	161	110	6.0	5.2	3.5	5	57	100
36	15.7	16.4	17.7	11.5	11.6	11.8	2240	2000	1440	43	42	36	247	218	178	6.9	6.1	4.9	6	56	100
41	16.8	17.6	18.7	12.4	12.4	12.6	2240	2000	1600	50	48	44	303	271	242	7.4	6.6	5.9	6	56	100
46	17.7	18.4	19.6	13.6	13.7	13.8	2160	1960	1600	53	52	48	353	320	293	7.7	7.0	6.4	8	54	100

*Plot size = 1/40 ha

Location: Middle River Species: Red Spruce

PSP#: 8428		Year Planted: c.1965		Spacing: 1.8x1.8m		Ownership: Crown		LC = 6.4		Texture: Silt Loam		Drainage: Well										
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Tress/Plot		% Sp.							
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live		Rs	Ws					
19	5.4	9.2	0.0	4.1	4.8	0.0	3040	80	0	7	1	0	15	1	0	0	38	79	21			
24	8.9	11.4	0.0	6.2	6.8	0.0	3040	1200	0	19	12	0	61	32	0	2.5	1.3	0.0	0	38	83	17
29	11.3	12.9	15.6	7.6	8.0	8.7	2960	1920	560	29	25	11	116	85	36	4.0	2.9	1.2	1	37	85	14
34	13.3	14.4	17.0	9.3	9.5	9.9	2800	2240	960	39	36	22	184	149	91	5.4	4.4	2.7	3	35	88	11
39	14.6	15.1	17.5	10.7	10.8	11.4	2640	2400	1280	44	43	31	236	203	148	8.1	5.2	3.8	5	33	90	10

*Plot size = 1/80 ha

White Spruce

Location: Dryden Lake Species: White Spruce

PSP#: 8441		Year Planted: c.1960		Spacing: 1.5x1.5m		Ownership: Private		LC = 9.9		Texture: Loamy Sand		Drainage: Excessive		Site Prep: Plow								
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot		% Sp.							
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live		Ws	Rs					
25	11.0	12.8	15.5	8.4	8.7	9.4	3040	2000	560	29	26	11	117	84	42	4.7	3.4	1.7	0	38	78	22
32	15.2	16.1	18.0	11.1	11.2	11.6	1740	1500	900	32	30	23	164	138	106	5.1	4.3	3.3	0	29	82	19
35	16.0	16.7	17.9	11.6	11.6	12.0	2250	2000	1500	45	44	38	238	205	180	8.8	5.9	5.1	6	45	85	3
40	17.2	17.7	18.5	14.5	14.6	14.8	2000	1850	1550	46	46	42	296	261	239	7.4	6.5	6.0	11	40	85	3

*Plot size = 1/80 ha the first year, 1/60 ha the second year, 1/50 ha the last 2 years

Location: Fox Harbour

Location: Fox Harbour		Species: White Spruce		PSP#: 9109		Year Planted: c.1979		Spacing: 1.9x1.9m		Ownership: Private		LC = 8.3									
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sap.						
	Total	Merch. Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.		Dead	Live				
12	6.9	9.9	0.0	4.4	4.7	0.0	2550	200	0	9	2	0	21	2	0	1.8	0.2	0.0	0	51	100
17	11.0	12.3	14.9	6.4	6.6	7.2	2550	1750	300	24	21	5	75	50	13	4.4	2.9	0.8	0	51	100
22	13.6	14.7	16.3	7.8	8.0	8.3	2550	2050	1200	37	35	25	138	110	77	6.3	5.0	3.5	0	51	100

*Plot size = 1/50 ha

Location: Glencoe Species: White Spruce

PSP#: 8424 Year Planted: c.1972

Spacing: 1.8x1.8m

Ownership: Crown

LC = 5.9

Texture: Sandy Loam

Drainage: Well

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot		% Sp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Ws	Rs
12	4.7	0.0	0.0	3.6	0.0	0.0	6	0	10	0	0.8	0.0	0	39	10	
17	7.7	10.9	0.0	5.2	6.2	0.0	14	5	37	10	2.2	0.6	0	39	100	
22	10.0	11.8	15.9	6.7	7.2	8.7	25	18	79	46	3.6	2.1	0	39	100	
27	11.7	13.0	16.2	8.3	8.6	9.2	30	29	129	90	4.8	3.3	1	38	100	
32	13.0	13.9	17.1	9.5	9.7	10.7	2800	2240	166	126	5.2	3.9	4	35	100	

*Plot size = 1/80 ha

Location: Landsdowne Species: White Spruce

PSP#: 8906 Year Planted: c.1966

Spacing: 1.8x1.8m

Ownership: Private

LC = 6.7

Texture: Sandy Loam

Drainage: Well

Site Prep: Plow

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot		% Sp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Ws	Rs
24	12.5	13.7	15.4	9.8	10.0	10.1	3360	2560	189	142	7.9	5.9	0	42	99	1
29	13.6	14.4	16.2	11.5	11.6	11.8	3280	2800	248	197	8.6	6.8	1	41	99	1
34	14.5	15.0	16.6	12.3	12.4	12.6	2960	2720	272	225	8.0	6.6	5	37	99	1
39	16.1	16.1	17.3	13.2	13.2	13.4	2320	2320	279	241	7.2	6.2	13	29	100	0

*Plot size = 1/80 ha

Location: Manganese Mines Species: White Spruce

PSP#: 8345 Year Planted: c.1966

Spacing: 1.8x1.8m

Ownership: Private

LC = 8.2

Texture: Sandy Clay Loam

Drainage: Well

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot		% Sp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Ws	Rs
14	5.5	0.0	0.0	3.7	0.0	0.0	6	0	12	0	0.9	0.0	0	55	100	
19	8.9	10.8	0.0	5.3	6.0	0.0	17	10	45	19	2.4	1.0	0	55	100	
24	11.7	12.2	15.6	8.0	8.2	9.4	2750	2300	112	79	4.7	3.3	0	55	100	
29	13.5	13.7	16.9	10.1	10.2	11.1	2750	2600	183	147	6.3	5.1	0	55	100	
34	14.8	14.9	18.0	11.8	11.8	12.8	2600	2550	238	200	7.0	5.9	4	52	100	

*Plot size = 1/50 ha

Location: Manganese Mines Species: White Spruce

PSP#: 8346		Year Planted: c. 1967		Spacing: 1.8x1.8m		Ownership: Private		LC = 8.4		Texture: Sandy Clay Loam		Drainage: Well	
Stump Age	DBH (cm)	Total	Merch.	Saw.	Height (m)	Density (stems/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)	MAI (m ³ /ha/yr)	#Trees/Plot*	% Spp.		
14	6.3	9.7	0.0	4.1	5.0	0.0	2650	150	0	17	1	0	53
19	9.5	10.9	0.0	6.3	6.6	0.0	2700	1700	0	58	33	0	53
24	12.2	13.2	15.9	8.9	9.1	9.7	2700	2150	650	133	100	49	53
29	14.1	14.7	17.1	11.3	11.4	11.9	2650	2400	1150	214	178	120	52
31	16.6	16.6	17.9	12.3	12.3	12.6	2550	2400	1350	239	202	150	51

*Plot size = 1/50 ha

Location: Middle River Species: White Spruce

PSP#: 8426		Year Planted: c. 1965		Spacing: 1.8x1.8m		Ownership: Crown		LC = 7.8		Texture: Silt Loam		Drainage: Well	
Stump Age	DBH (cm)	Total	Merch.	Saw.	Height (m)	Density (stems/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)	MAI (m ³ /ha/yr)	#Trees/Plot*	% Spp.		
19	9.2	10.2	0.0	6.2	6.5	0.0	3150	1710	0	63	26	0	35
24	11.1	11.5	14.2	8.3	8.4	9.6	3150	2790	90	119	81	4	35
29	12.7	12.8	15.3	10.3	10.3	11.5	3060	2970	900	184	143	64	34
34	13.8	14.0	16.7	11.4	11.4	12.9	3060	2970	1080	236	194	110	34
39	14.6	14.6	16.8	12.9	12.9	13.9	2970	2970	1530	287	241	170	33

*Plot size = 1/90 ha

Location: Mt. Thom Species: White Spruce

PSP#: 0401		Year Planted: 1980		Spacing: 1.8x1.8m		Ownership: Crown		LC = 7.7		Site Prep: Plow (planted in trench)		Weeding: Chemical	
Stump Age	DBH (cm)	Total	Merch.	Saw.	Height (m)	Density (stems/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)	MAI (m ³ /ha/yr)	#Trees/Plot*	% Spp.		
25	12.9	13.6	17.0	8.1	8.2	9.3	3120	2720	800	160	127	72	39
							41	39	18	6.4	5.1	2.9	100

*Plot size = 1/90 ha

Location: Mt. Thom Species: White Spruce

PSP#: 0402		Year Planted: 1980		Spacing: 1.8x1.8m		Ownership: Crown		LC = 7.6		Site Prep: Plow (planted on mound)		Weeding: Chemical	
Stump Age	DBH (cm)	Total	Merch.	Saw.	Height (m)	Density (stems/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)	MAI (m ³ /ha/yr)	#Trees/Plot*	% Spp.		
25	13.2	13.4	15.2	8.6	8.6	9.2	3680	3520	1120	51	50	20	46
							51	50	20	208	165	66	100

*Plot size = 1/90 ha

White and Red Spruce

Location: Middle River Species: WhiteRed Spruce

PSP#: 8427 Year Planted: c. 1965

Spacing: 1.8x1.8m

Drainage: Well

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Spp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Ws	Rs
19	5.4	9.8	0.0	4.2	5.5	0.0	3240	180	0	16	2	0	0	36	62	39
24	8.7	11.5	15.5	6.2	6.8	7.6	3240	1170	90	19	12	2	0	36	58	42
29	11.2	12.9	16.6	8.4	8.7	9.4	3060	2070	450	30	27	10	124	91	34	57
34	13.0	14.1	17.1	10.1	10.3	10.8	2880	2340	990	38	37	23	188	152	55	45
39	14.4	15.2	17.7	11.9	12.1	12.5	2700	2340	1260	44	42	31	247	207	55	45

*Plot size = 1/90 ha

Red Pine

Location: Centerdale Species: Red pine

PSP#: 8443 (Cut) Year Planted: c. 1938

Spacing: 1.2x1.5m

Ownership: Private

LC = 9.4

Texture: Sandy Loam

Drainage: Well

Site Prep: Plow

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Spp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Pr	
47	18.0	18.0	18.5	18.9	18.9	19.1	2000	2000	1760	51	51	47	433	400	360	100

*Plot size = 1/40 ha

Location: Debert Species: Red pine

PSP#: 7918 Year Planted: c. 1957

Spacing: 1.5x1.5m

Ownership: Crown

LC = 7.9

Texture: Sandy Loam

Drainage: Well

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Spp.	
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live	Pr	
26	11.8	12.9	15.4	9.8	9.9	10.0	4400	3400	800	48	44	15	226	168	53	100
31	13.2	14.2	16.1	12.2	12.3	12.4	4200	3400	1600	58	54	33	331	266	162	100
36	14.6	15.2	16.5	14.1	14.2	14.3	3700	3300	2200	62	60	47	407	347	251	100
41	15.8	15.8	16.8	15.5	15.5	15.7	3100	3100	2300	61	61	51	436	389	299	100
46	16.5	16.5	17.3	16.8	16.8	16.9	2800	2800	2300	60	60	54	462	417	347	100

*Plot size = 1/100 ha

Location: Debert Species: Red pine

PSP#: 7921 Year Planted: c.1962

Spacing: 1.8x1.8m

Ownership: Crown

LC = 10.1

Texture: Sandy Loam

Drainage: Well

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sp.	
	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Dead	Live	Pr	Ws
17	13.1	13.7	15.5	7.8	7.8	8.1	2940	2640	1200	40	39	23	150	123	66	2
22	15.1	15.8	17.4	10.3	10.4	10.6	2820	2520	1620	51	50	39	249	219	163	2
27	16.5	16.7	18.0	13.3	13.3	13.4	2400	2340	1740	52	51	44	320	288	239	2
32	17.7	17.7	19.0	15.5	15.5	15.7	2160	2160	1680	53	53	47	379	346	304	3
37	18.5	18.5	19.8	16.9	16.9	17.1	2040	2040	1620	55	55	50	424	392	353	3
42	19.9	19.9	20.9	18.0	18.0	18.2	1980	1980	1680	62	62	58	504	471	444	3

*Plot size = 1/60 ha

Location: Dryden Lake Species: Red pine

PSP#: 8439 Year Planted: c.1957

Spacing: 1.5x1.8m

Ownership: Private

LC = 7.3

Texture: Loamy Sand

Drainage: Excessive

Site Prep: Plow

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sp.	
	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Dead	Live	Pr	Ws
30	15.0	15.3	17.0	10.3	10.3	10.4	2640	2520	1440	47	46	33	230	200	139	2
37	17.3	17.3	18.2	13.1	13.1	13.2	2520	2520	2040	59	59	53	364	332	283	2
40	17.6	17.6	18.5	13.9	13.9	14.0	2460	2460	2040	60	60	55	390	357	312	2
45	18.9	18.9	19.2	15.2	15.2	15.2	2100	2100	1980	59	59	57	413	384	360	2

*Plot size = 1/60 ha

Location: Glengarry Species: Red pine

PSP#: 8444 Year Planted: c.1939

Spacing: 1.5x1.8m

Ownership: Private

LC = 10.5

Texture: Sandy Loam

Drainage: Well

Site Prep: Nil

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sp.	
	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Total	Merch.	Dead	Live	Pr	Ws
45	17.4	17.4	18.6	19.2	19.2	19.5	2880	2880	2220	69	69	60	597	546	469	2
52	19.2	19.2	19.8	22.3	22.3	22.5	2100	2100	1860	61	61	57	602	560	519	2
55	20.5	20.5	20.7	23.5	23.5	23.5	2040	2040	1980	67	67	66	698	655	637	2
60	21.3	21.3	21.6	25.0	25.0	25.0	1680	1680	1620	60	60	59	656	618	609	2
65	23.4	23.4	23.4	25.8	25.8	25.8	1260	1260	1260	54	54	54	606	576	576	2

*Plot size = 1/60 ha

Location: Middle River
PSP#: 9309 Year Planted: c. 1965 Species: Red pine

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sp. Pr						
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live							
28	15.9	16.5	17.5	11.4	11.4	11.6	2700	2460	1920	54	52	46	290	257	215	10.4	9.2	7.7	0	45	100
33	16.9	17.4	18.3	13.2	13.2	13.3	2580	2400	1980	58	57	52	356	321	279	10.8	9.7	8.5	2	43	100
38	17.8	18.1	19.1	14.4	14.4	14.5	2520	2400	1980	62	62	57	417	382	339	11.0	10.1	8.9	3	42	100

*Plot size = 1/60 ha

Scots Pine

Location: Lorne
PSP#: 8445 Year Planted: c. 1927 Species: Scots pine

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Spp.						
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live		Ps					
57	32.2	32.2	32.2	21.4	21.4	21.4	865	865	865	70	70	70	671	645	645	11.8	11.3	11.3	0	35	100
64	32.8	32.8	32.8	23.7	23.7	23.7	800	800	800	67	67	67	702	675	675	11.0	10.5	10.5	0	32	100
67	34.3	34.3	34.3	24.1	24.1	24.1	800	800	800	74	74	74	782	753	753	11.7	11.2	11.2	2	32	100
72	35.0	35.0	35.0	25.0	25.0	25.0	800	800	800	77	77	77	839	808	808	11.7	11.2	11.2	2	32	100
77	36.1	36.1	36.1	26.7	26.7	26.7	775	775	775	79	79	79	919	885	885	11.9	11.5	11.5	3	31	100

*Plot size = 1/25 ha

White Pine

Location: Fox Harbour Species: White pine

Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Spp.						
	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Total	Merch. Saw.	Dead	Live		Pw					
17	12.5	12.7	15.2	8.0	8.0	9.3	2700	2520	480	33	32	9	124	95	27	7.3	5.6	1.6	0	45	100
22	15.5	15.7	16.8	10.3	10.3	10.5	2400	2340	1620	45	45	36	217	188	141	9.9	8.5	6.4	5	40	100
27	17.6	17.6	18.2	12.6	12.6	12.6	2100	2100	1860	51	51	48	297	267	244	11.0	9.9	9.0	10	35	100

*Plot size = 1/60 ha

Location: Lorne			Species: White pine			PSP#: 8524		Year Planted: c. 1935		Spacing: 1.5x1.8m		Ownership: Private		LC = 10.2		Texture: Silty Loam		Drainage: Well		Site Prep: Nil	
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m ² /ha)		Volume (m ³ /ha)		MAI (m ³ /ha/yr)		#Trees/Plot*		% Sp.						
	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Dead	Live	Pw			
48	21.8	21.8	22.0	20.6	20.6	20.7	1520	1520	1480	57	57	56	513	478	478	10.7	10.0	10.0	0	38	100
54	23.3	23.3	23.3	22.6	22.6	22.6	1280	1280	1280	55	55	55	536	503	503	9.9	9.3	9.3	0	32	100
57	24.7	24.7	24.7	23.4	23.4	23.4	1260	1260	1260	61	61	61	613	578	578	10.8	10.1	10.1	5	21	100
62	25.6	25.6	25.6	24.6	24.6	24.6	1140	1140	1140	59	59	59	621	587	587	10.0	9.5	9.5	7	19	100
67	26.6	26.6	26.6	24.8	24.8	24.8	1020	1020	1020	57	57	57	606	575	575	9.0	8.6	8.6	9	17	100

*Plot size = 1/40 ha the first 2 years; 1/60 ha the last 3 years

Japanese Larch

Location: Abercrombie				Species: Japanese Larch				PSP#: 9100													
Year Planted: c. 1975		Spacing: 3.0x3.0m		Ownership: Private				LC = 13.5+				Texture: Loam		Drainage: Well		Site Prep: Nil					
Stump Age	DBH (cm)		Height (m)		Density (stems/ha)		Basal Area (m2/ha)		Volume (m3/ha)		MAI (m3/ha/yr)		#Trees/Plot*		% Sp.						
	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Total	Merch.	Saw.	Dead	Live							
11	15.8	16.1	17.4	9.3	9.3	9.7	880	840	600	17	17	14	77	68	57	7.0	6.2	5.2	0	22	100
13	17.4	17.7	18.5	10.7	10.7	10.9	880	840	720	21	21	19	106	96	88	8.2	7.4	6.8	0	22	100
15	19.5	19.5	19.8	12.4	12.4	12.4	840	840	800	25	25	25	146	134	131	9.7	8.9	8.7	0	21	100
16	20.5	20.5	20.7	13.0	13.0	13.1	840	840	800	28	28	27	168	155	153	10.5	9.7	9.6	0	21	100
18	21.6	21.6	21.9	13.7	13.7	13.8	840	840	800	31	31	30	196	182	182	10.9	10.1	10.1	0	21	100
19	21.9	21.9	22.2	14.4	14.4	14.5	840	840	800	32	32	31	211	197	197	11.1	10.4	10.4	0	21	100
22	23.7	23.7	23.7	16.6	16.6	16.6	840	840	840	37	37	37	279	261	261	12.7	11.9	11.9	0	21	100
26	24.8	24.8	24.8	16.9	16.9	16.9	840	840	840	41	41	41	313	294	294	12.0	11.3	11.3	0	21	100
29	25.8	25.8	25.8	18.2	18.2	18.2	800	800	800	42	42	42	344	324	324	11.9	11.2	11.2	1	20	100

*Plot size = 1/40 ha

